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Looks At NCC

By Ronald A. Frank
Of the CW Staff

ANAHEIM, Calif. – There was no recession here last week as more than 32,000 converged on the Anaheim Convention Center for the annual National Computer Conference.

It was an upbeat show all the way, with a packed exhibition and well-attended technical sessions for the most part – all pointing to a generally optimistic feeling from both users and vendors.

A total of 278 equipment suppliers and other companies used 799 booths to display their products and services to potential users who, in many cases, were very specific about the solutions they were seeking.

The exhibition was dominated by minicomputers and their related products along with terminals, and the major mainframe vendors were conspicuous by their absence. IBM and Control Data Corp. were on the floor, but they stayed away from large systems.

IBM demonstrated terminals operating in a simulated Systems Network Architecture (SNA) mode. The terminals were not connected to a mainframe and were operating to a local controller at the booth. In keeping with the small system emphasis, IBM showed its System/32.

CDC showed its mass storage tape system, which was the only major IBM 370 peripheral introduced at the show.

The trend toward more powerful minis and terminals was stressed with the mini vendors talking about "superminis" that could be compared in power (but not in cost) with medium-scale IBM mainframes.

In the terminal area, several companies

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COMPUTERWORLD

THE NEWSWEEKLY FOR THE COMPUTER COMMUNITY

Weekly Newspaper Second-class postage paid at Boston, Mass., and additional mailing offices

© 1975 by Computerworld, Inc.
Price: $12/year May 28, 1975 Vol. IX, No. 22

Government Opens Antitrust Case Against IBM

• Starts Off With 'Old Issues'

By Edith Holmes
And E. Drake Lundell Jr.
Of the CW Staff

NEW YORK – The long-awaited antitrust suit brought by the Justice Department against IBM began at the U.S. District Court here last week with the government's opening statement.

Several members of the Justice Department's legal team delivered the statement, which dealt with the so-called "old issues" in the case – those centering around charges that "IBM monopolized and intended to monopolize the general-purpose electronic digital computer systems market."

Two additional issues contained in the government's amended complaint against the corporation involve charges that IBM monopolized and intended to monopolize the related peripherals and leasing markets as well. The government told Chief Judge David N. Edelstein it would present its opening statement on these matters once IBM has prepared its defense of them.

Will Seek Divestiture

Should it win its case, the government will seek divestiture and other relief to restore competition in the DP industry, according to Raymond M. Carlson, lead attorney for the Justice Department.

He said the government will bring evidence to show the charges involve the power to fix prices or exclude competition and that IBM had "intent to exercise that power."

Evidence will include the metes and bounds of the market or markets monpolized and IBM's possession of the power to monopolize and IBM's intent to monopolize these markets, he added.

Carlson said the government will rely on three basic sets of records: IBM's internal files; the records of its competitors, used by these firms to track their status in the marketplace; and company statistics identifying each corporation's share of the DP market.

In proving "intent to monopolize," he noted the Justice Department will discuss those IBM acts and conduct in the marketplace that have demonstrated its attempts and ability to control prices.

In addition, the government will present statements by IBM officials contained in IBM internal documents to illustrate in-

(Continued on Page 5)

• Families Watch From the Sides

By Edith Holmes
And E. Drake Lundell Jr.
Of the CW Staff

NEW YORK – "Are you ready, gentlemen?"

With those words, Judge David N. Edelstein launched the trial of the U.S. Government's massive antitrust suit against IBM in Federal District Court here last week, ending over six years of delay.

"May it please the court, I am Raymond Carlson, an attorney with the Department of Justice."

And that is how Carlson – the lead government attorney – entered into his opening statement outlining the government's charges against IBM, as his wife and children watched from the spectator benches.

Another interested spectator of the early action was Frank T. Cary, who sat in the IBM section across the aisle, impassively listening to the charges against the $1-billion-a-year corporation which he heads as chairman.

Cary, joined on opening day by Gilbert Jones, vice-chairman for the firm, and by the wife of one of the IBM lawyers, Bruce Bromely, in addition to his phalanx of public relations personnel, sat quietly, watching Carlson closely and intently, as Carlson described IBM as guilty of monopoly and attempts to monopolize.

Power to Fix Prices

Shifting his weight from foot to foot and largely reading his statement, Carlson charged IBM has had the power to fix prices and the intent to exercise that power in the "general-purpose electronic digital systems market" during the 1960 to 1972 time frame addressed by the suit.

IBM had 70% of this market during the time period, Carlson, who often twisted a pen between his fingers, claimed. None of its competitors in that market – Control Data Corp., General Electric, RCA, Burroughs Corp., Univac, NCR, Honeywell – ever had more than 10%, he added.

On the first day, while wives and children watched from the space reserved for the government in the courtroom, the IBM side was filled primarily with lawyers and company executives.

Carlson said he would prove IBM's dominant position through IBM records,

(Continued on Page 4)

CDC 38500 Mass Storage System For Big 370s Makes NCC Debut

By Vic Farmer
Of the CW Staff

ANAHEIM, Calif. – Although its media is similar but not compatible to IBM's 3850, the 38500 mass storage system Control Data Corp. announced here last week promises to give users of IBM 370/145s and up another choice for a mass storage device.

The CDC 38500 storage mechanism looks very much like photographs of the IBM 3850 in that the media is contained in small cylinder-like devices that sit in a honeycomb structure.

But unlike the yet-to-be-publicly-demonstrated IBM 3850, CDC brought its engineering model of the 38500 to the National Computer Convention (NCC) and ran it through three demonstrations an hour to about 40 or 50 people each time.

IBM, in the last six months since it introduced its 3850, had originally offered to demonstrate its mass storage memory to *Computerworld*, but then reneged.

The 38500, however, does have major design differences in comparison with the IBM model:

(Continued on Page 2)

CW Photo by V. Farmer

CDC demonstrates its 38500 mass storage system.

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Second-class postage paid at Boston, Mass., and additional mailing offices. Published weekly (except: a single combined issue for the last week in December and the first week in January) by Computerworld, Inc., 797 Washington St., Newton, Mass. 02160.
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50 cents a copy; $12 a year in the U.S.; $20 a year for Canada and PUAS; all other foreign, $36 a year. Four weeks notice required for change of address.
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Computerworld can be purchased on 35mm microfilm in half-volumes (six-month periods) through University Microfilm, Periodical Entry Dept., 300 Zeeb Rd., Ann Arbor, Mich. 48106. Phone: (313) 761-4700.

COMPUTERWORLD, INC.
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ABC ABP AIA

POSTMASTER: Send Form 3579 (Change of Address) to Computerworld Circulation Dept., 797 Washington St., Newton, Massachusetts 02160.

For 370/145s and Up

CDC Introduces Competitor to IBM 3850

(Continued from Page 1)

- CDC's unit will operate with any OS on 370s vs. IBM's which will operate with VS only.
- CDC's unit formats data in data sets vs. IBM's disk-like volume on two cartridges.
- CDC's cartridge size is 8M bytes vs. IBM's 50M bytes.
- CDC's cartridge is only 25% cheaper – $15 vs. $20 for IBM's.
- CDC's unit allows the CPU to work directly on sequential tape data in addition to using a disk staging scheme vs. IBM's limitation to staging data in disk format only.
- CDC's unit works with an IBM-type 3830 Model 2 controller vs. IBM's requirement of a 3830 Model 3-type controller.
- CDC's unit does not require dedicated disks while the IBM unit does.
- Data on the CDC cartridge is recorded in eight streams along the 150-in. length of the 2.75-in.-wide tape vs. IBM's helical diagonal recording technique.

Mass Storage System Components

The basic 38500 provides a maximum of 16 billion characters of stored data and may be under the control of up to four 370 CPUs. Programming support is by means of the new Virtual Data Set Access Method (Vdam) software controlled by 370 OS/MFT, MVT, VS 1 or VS 2 operating systems.

Each 38500 consists of two major subsystems, the mass storage facility and a standard 3330-type disk storage subsystem.

The storage facility stores 2,000 cartridges and includes a selector mechanism and from two to four stations for automatic reading and writing of data. Basic system capacity and number of stations can be modularly expanded as user needs grow, according to CDC.

A Vdam capability, called user sequential, permits the computer to directly access data sets stored in cartridges in the system's storage library without having to stage the data set to disk. Data transfer rate is 806 kbytes direct and about 400 kbytes staged.

The computer then processes this data in a sequential operating mode, identical to the method used in current tape processing. Job control language parameters indicate user sequential operation.

The user sequential capability coexists with staging data to disk in a properly configured system.

Another direct data transfer method, called user direct, allows the user to require a specific block from within a designated data set. Vdam will access the appropriate data cartridge, locate the block and transfer it to the computer without intermediate staging to disk. Following data transfer, the cartridge is immediately returned to its location in the mass storage file, CDC said.

Data Staging

When a data set is to be staged on disk, Vdam determines data set size and requests the appropriate amount of disk space from the operating system, CDC said.

Vdam, when disk space is available, then picks the proper cartridge from the library, moves it to an available read/write station, loads and begins to read data sets from mass storage to disk. Vdam then makes the data set available to the user program for normal computer processing.

This data set staging is completely transparent to user jobs; user programs process data directly from disk without being aware of the fact data originated in the mass storage facility, CDC said.

Fast cartridge access is achieved through the automatic queuing of cartridges at the five positions within each cartridge transport.

Archiving can be performed concurrently with other job processing and data set staging in the system and is completely transparent to the user programs, CDC added.

Mass Storage Prices, Availability

The basic 38500 mass storage system includes a 2,000-cartridge file unit with two read/write stations, disk storage controller, control adapter unit and the Vdam software.

Also available are dual-path and string-switch options which allow the user operating redundancy and multiple data path flexibility, CDC said.

First customer production shipments of the 38500 are scheduled to be made in the fourth quarter of 1976.

The basic 38500 system with one 2,000-compartment file unit, two read/write stations and software can be purchased for $326,335. Individual file units, read/write stations, mass storage adapters and control units can be added to meet users' varying requirements, CDC said.

Monthly lease for this basic system under CDC's Commercial Term Plan (three-year, one-year noncancellable provision) is $9,340, including software. Basic system maintenance, priced separately, is $987/mo.

32,000 Converge on Anaheim NCC

(Continued from Page 1)

showed floppy disk buffers that could interface to a variety of CRT displays. The floppy disks added enough storage to basic CRTs to turn them into more intelligent devices. Many of the mini-based systems had the capability to interface with displays to form in-house time-sharing systems.

There was increased emphasis on the problems of the user in the 89 technical sessions, and there were several applications areas including banking and health care. But despite an attempt toward more practical sessions, the majority of the technical program was still devoted to more theoretical subjects.

Neither those participating in the sessions nor the attendees had any conclusions on the way to reduce the gap that still exists between the technical specialists and the needs of the user. On the exhibition floor, however, vendors agreed there was a higher level of sophistication shown by visitors.

Underlying the many terminals being shown on the floor was a high interest in emerging communications networks, especially the packet-switched systems now being implemented in the U.S.

Conference visitors were generally optimistic about the health of the industry. Exhibitors reported there were less "just-curious" show visitors and more determined to finalize their purchase plans. Although some DP managers reported budget cuts, most felt upgrades and expansions were common.

By noon on Wednesday, the American Federation of Information Processing Societies (Afips), one of the NCC sponsors, reported conference attendance had almost equaled the 25,900 total attendance of last year's conference in Chicago. It was expected that final attendance for this year's show would top the 1973 NCC in New York, which drew 32,000.

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SyncSort II (introduced: 1973)

- Secondary allocation.
- Release of excess disk space.
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- Alternate parm for invoked sorts.
- Additional sorting improvements on non-random data through BIAS parameter.

SyncSort III and III-and-a-half (introduced: 1974/1975)

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WHITLOW

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U.S. to Rely on Figures, Economists

IBM Plans on User Testimony to Bolster Its Defense

By Edith Holmes
And E. Drake Lundell Jr.
Of the CW Staff

NEW YORK – While the U.S. Government plans to rely heavily on computer industry figures and economists to prove its case of monopolizations against IBM, the company will call heavily on computer users for its defense, the sides indicated last week during opening rounds of the trial of the case.

During the opening of the trial, other elements of the strategy to be used by each side also became evident.

Of the 67 witnesses the government presently has lined up to testify, 43 are industry figures, primarily working for firms that compete with IBM.

There are four consultants and five who are from universities or other research organizations who are users of computer equipment.

Most of the rest of the government witnesses are either accountants or economists used by the government in the case.

In all, the government estimated it will take over 65 days to present its evidence in the case, but that does not count the cross-examination time.

Only the Beginning

But that is only the beginning – IBM plans to present 402 witnesses at the trial. This would include 134 users, because "users have to be heard in this case," according to the firm's attorneys.

In opening statements, the firm's attorneys indicated they expected these users, which come from a cross section of industry and installation sizes, to testify to the growing number of choices available to them in the market for DP equipment and services.

Of these users, nine are in the $500,000 to $1 million monthly rental category, 47 spend between $100,000 and $500,000, 41 spend between $10,000 and $100,000 each month for equipment and 23 spend under that for equipment.

In addition to testifying to the increasing amount of competition in the business, IBM said the users would testify the distinction between business and other applications was just not realistic in their operations as the government claimed it is.

Other witnesses lined up by IBM include 129 present or former IBMers, 44 consultants, 14 educators, 19 economists, 59 "experts" of one type or another and three former government employees.

Besides this rash of users and other testimony, IBM will try to discount the documents used by the government to prove its case against the firm – especially those damaging documents that come from IBM files.

Already in Process

This has already started, with Thomas D. Barr, the firm's lead attorney, noting last week only 29 of the documents that will be entered are signed by top management of IBM, and 407 of the documents or 46% of the total are signed by personnel below the level of divisional vice-president. He said there were over 70,000 people in this category.

The government can't hope to show the thought or intent of the entire company by using such documents, Barr contended, noting the documents being used by the government had been culled from more than 7 million given to the government by IBM.

At the same time, Barr contended that, in an organization the size of IBM, it was not unusual for some employees to have thoughts that were "not the most brilliant in the world," but he contended that those thoughts could not be used to show the intent of the entire company.

Besides that, IBM largely contended, even if it performed the acts claimed by the government, there was nothing wrong with those activities. For example, the firm claimed offering educational allowances was not wrong or unlawful, but rather a public service for the public good and promised to offer examples of where government officials had praised it for the practice.

Likewise, the firm will claim bundling is not illegal, but rather a perfectly legal practice forced upon it by the users, including the government as the largest user in the world.

The judge will have the difficult task of sorting out the statements of possibly interested competitors and weighing them against the evidence of users and other third parties when he comes to make his decision in the case – which will probably be well over a year from now.

Analysis

IBM Credits Success to Right Judgments

By Edith Holmes
And E. Drake Lundell Jr.
Of the CW Staff

NEW YORK – IBM is successful in the computer field because the company's management made the right judgments and was willing to back those judgments with resources, IBM lawyers argued here last week as the government's antitrust suit against the firm opened.

IBM's management literally "bet the company" to back some of those management decisions, Thomas D. Barr, lead IBM attorney said, adding the results have produced the "greatest good for the greatest number of people."

Conceding IBM was indeed larger than many of its competitors, Barr indicated the government's whole case was based on size alone, even though IBM had achieved its present size through fair competition.

Furthermore, Barr said, "monopoly means stagnation," and the computer industry has been the "most dynamic, changing and competitive industry in the country."

Failed to Make Commitment

In the 1950s, Barr said, IBM was relatively small compared to some of its competitors in the computer field, particularly firms such as General Electric (GE) and RCA, but most firms hesitated because of internal problems and, therefore, failed to make the necessary commitment to the market.

In addition, he said, most of the firms that compete have done very well in the computer business. Another IBM lawyer pointed out others in the field have grown at an average annual compound rate of 21% between 1952 and 1972, while IBM grew at only a 17% rate.

While the government relies on the withdrawal of RCA and GE from the computer industry to help prove its point, Barr said he "welcomed" the issue.

The true story is, he said, of a small company (IBM) that was committed to a product defeating the giants of the electronics industry.

Both could have been successful, he said, but the giants did not see what IBM saw.

"IBM seized the future, while the others did not," Barr said.

Noting that the government was going to call a number of witnesses from Control Data Corp., Barr said that firm represented perhaps the most amazing success story in the business, having gone from almost nothing in the late 1950s to one of the Fortune 500 today.

Furthermore, Barr said the government's definition of the market, which limits the market to the major mainframe makers only, was unrealistic in terms of the real world and promised to call a whole host of users and other witnesses to testify to the competition in the field.

David Boies, who followed IBM in its opening statement, indicated that IBM has identified 128 companies that make computer systems, not just the eight mentioned by the government, and added that the documents relied upon by the government show an even larger number of companies.

Competition is strong in the computer industry, he said, and IBM has to continually react to the competition which is a sign there is no monopoly.

Furthermore, there is easy entry into the market, and the number of firms participating in it has risen rapidly, he said. In addition, the competition is strong and growing faster than IBM, no matter what measure you use, he added.

Even on a market-share basis, Boies said the IBM share had been falling dramatically in the past 10 years, and it was not more than 32% of the overall market, nor more than 62% of the very narrow market defined by the government, he said.

Finally, attorney Paul Dodyk argued that the practices of IBM the government claimed to be bad – educational allowances, bundling and the announcement of certain 360 systems – are in reality socially desirable acts and most of them had been approved by the government at one time or another.

Bundling, in particular, was urged on the company by users who needed the bundled services to get their system operating properly, he said, while educational allowances just helped spread knowledge of computers and computing, allowing the widespread use seen today.

Justice Wives, IBM Lawyers Watch From the Side

(Continued from Page 1)

competitors' records and outside statistical sources.

That audience breakdown – with friends, children and wives filling the government side and company satraps the IBM benches – held until day three when the wife and two daughters of one of the IBM lawyers came to hear him make his part of the opening statement.

In the generally hot and humid courtroom, Thomas D. Barr, the lead IBM attorney, either folded his hands as if in prayer or steepled his fingers, when he was not writing notes on Carlson's presentation, often staring at the ceiling or one of the four hanging lamps in the large, dark courtroom.

Striking Difference

There is a striking difference between the two legal teams which becomes more and more apparent as Carlson's presentation was followed by presentations of the rest of the government team.

The Justice Department lawyers are younger and are a more diverse-looking group than the attorneys huddled around the IBM table.

The IBM attorneys were uniformly attired in dark blue on the opening day, and several sported the blue ties with small white polka dots so favored by team leader Thomas Barr. The white shirts and subdued ties perhaps would stand out more on a modern street than the attire of the justice lawyers – with an average age of 31 – with their different-colored suits, multihued shirts and brighter ties.

The differences went even to the little things – IBM had water glasses on the table for its attorneys, while the government lawyers had to be content with what appeared to be World War II, government-issue folding paper cups.

Edelstein – who reportedly is keeping fit at 65 for the rigors of the trial by jumping rope and shadowboxing – watched the performance of each side impassively, but with growing annoyance as the lawyers for both parties continually tried to argue the case instead of just outlining what each hoped to prove.

Continually reprimanding the lawyers for this tactic, he finally declared both of the opening statements could be stricken from the record, and nothing would be lost at all.

Sketch artists recording the proceedings for television stations or magazines noted several of the participants appeared vain, removing glasses when they noticed the artists were working on them. One said both the judge and Nicholas Katzenbach, IBM counsel, were particularly noticeable in this habit.

Both sides finished their arguments and, after all the general media interests had petered out, the real business of the trial got started with the calling of the first witness, who is expected to instruct the court in the intricacies of data processing.

No one ever said antitrust trials were the most exciting legal actions around, but one of the marshals overseeing crowd control here last week stated it succinctly when he said he would rather be upstairs listening to the trial of some black liberation army members. On the second day of the trial, he was.

Edelstein Thinking Ahead

NEW YORK – Based on the first two and a half days, "I have figured that this trial may last five or 10 years," Judge David N. Edelstein told lawyers for IBM and the Justice Department in chambers here last week.

Because of this, he asked both sets of attorneys to prepare successors for themselves "to take the case over within a reasonable time if the lead attorney, for some reason, is disqualified, disabled or whatever."

At the same time the judge asked "in the event of the disability or incapacity of the judge for reasons of illness, death or whatever, that both sides stipulate the record" so the trial does not have to start all over again.

Raymond Carlson, lead attorney for the government, immediately agreed to abide by the judge's wishes. But Thomas D. Barr, lead IBM attorney, indicated he could not agree with the request until he had discussed it with Nicholas deB. Katzenbach, IBM vice-president and counsel.

NCCers Split on Merits of Cobol Standard Changes

By Don Leavitt
Of the CW Staff

ANAHEIM, Calif. – Cobol '74 is about twice as large – in terms of built-in capabilities – as Cobol '68, and this pattern of growth is good or bad, depending on who was speaking at an NCC session on the impact of the new standard on software engineering.

Jitze Couperus of Control Data Corp. and chairman of American National Standards Institute Committee X3J4 (which put the standards together) said the difference is too much for most users. "Federal pressure" will bring new compilers in a year or two "and users will be mad," he said.

The old standard left the programmer working by the seat-of-the-pants, and they have gotten used to that, he said, but the new standard is geared to acting as a "total application development system." The chores of interfacing the application logic with other elements of the system are now part of Cobol.

Author Paul McCracken said: "The theology of differences is not for me. I'm interested in making Cobol programs extremely understandable by people." Debugging should be easier with improved understandability; responsibility can be shared during development; and maintenance after development is also eased, he said.

The ideas of structured programming lead to better programs, and Cobol – especially Cobol '74 – is better for structured coding than many claim. A few more extensions would be nice, McCracken added, but an application system development tool is not what he wanted: "If I wanted PL/I, I'd get PL/I," he quipped to a burst of applause.

Changes Outlined

Earlier in the session, Margaret M. Cook of the Federal Cobol Compiler Testing Service outlined the changes made in Cobol with the now year-old standard. Several of the modules, including the nucleus of the language, have been revised and three – covering interprogram communication, debugging and message-oriented communications – are completely new.

A collating sequence clause built into both the nucleus and the sort (now sort/merge) module may be one of the features that will finally lead to portable Cobol programs. This feature allows the user to specify what code scheme is being used – Ascii, "native" or used-defined – which in turn determines how data fields are handled.

Series of Deficiencies

Dr. Paul Oliver, head of the Navy's Cobol Testing Service and chairman of this session, made light of his own presentation, but, nontheless, picked out a series of deficiencies he found in the new standard and one basic, but only slightly facetious, recommendation.

The growth pattern of the language is all wrong, he said. Cobol now is "too large for users, for implementors and for developments or standardizers to manage. I'd like to see qualitative, not quantitative, growth."

The current language specifications suffer from a conflict or confusion over functional vs. structural modularity. Oliver had commented earlier that structured programming was getting "a lot of undue attention," but that Cobol '74 has several "contributions" supporting the more stringent discipline.

In his list of deficiencies, however, he noted making structured constructs work in Cobol takes more effort than in other languages. "It doesn't take a whole book to describe how to do it in Fortran or PL/I," he noted.

Features Undefined

Oliver also rapped the standard hard for its "lack of rigor," noting in too many places the way a feature is put into effect was left undefined and up to the discretion of the implementor. In particular, he pointed to the Compute verb as one of the vital but undefined features.

The "persistence of data" is another deficiency in Cobol, Oliver said. Once defined, data is available throughout the program whether it is needed or not. And that means it can be changed "anywhere even if the change is unintentional.

Retrenchment Advised

Oliver's recommendation? Retrench. The language developers should recognize size doesn't necessarily equal quality. Machine-dependent language features cannot lead to machine-independent programs.

For their part, both users and implementors should recognize good programming, ease of debugging and robustness of language – including clear definitions – are good goals.

All of us must learn to ignore stereotypes, he said, noting Cobol can be used for more than accounting work, and Fortran can be used quite effectively in business DP situations.

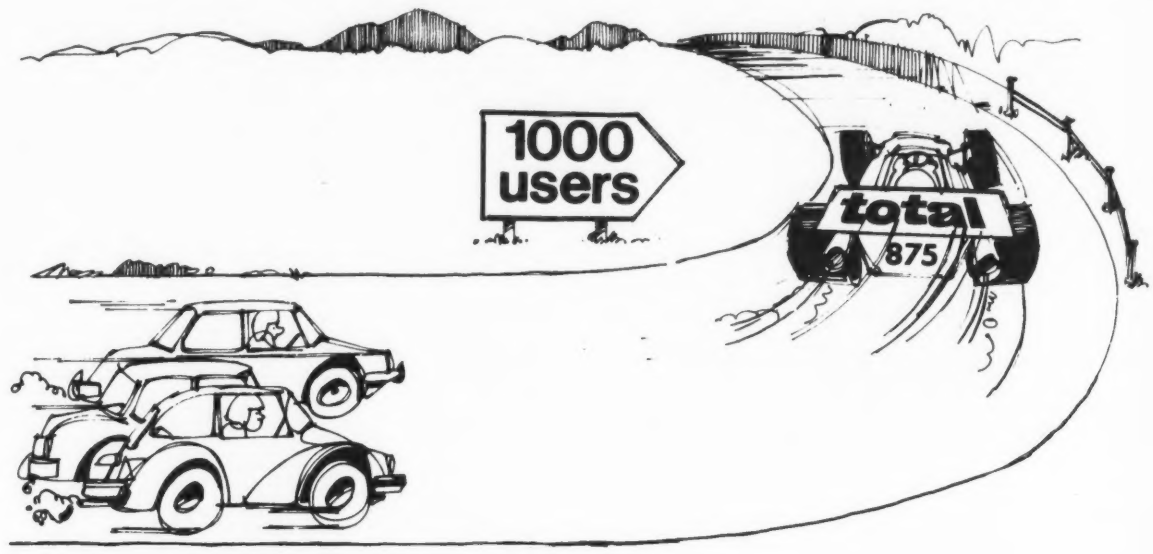
Government Opens IBM Antitrust Trial With 'Old Issues'

(Continued from Page 1)

tent, Carlson said.

The lead government attorney divided responsibility for the issues of the case among the members of his team. Those areas covered by eight of the lawyers during the opening statement included:

- The withdrawal of General Electric Co. and RCA Corp. from the computer industry, allegedly because of "insurmountable barriers" raised by IBM.
- The lease-oriented nature of the general-purpose systems market as another barrier to easy entry by IBM competitors.
- The nature, scope and definition of the market IBM is supposed to have monopolized.
- An economic analysis of the market based, in part, on the notion of market share.
- And four principal IBM practices that are said by the government to indicate monopolistic intentions – its "bundling" of equipment, maintenance, programming and other services under a single price until 1969; its announcement of "fighting machines," in particular IBM's 360/90, 360/44 and 360/67, prematurely to offset competitors' strengths; its granting of "educational allowances" to prominent universities; and the establishment of technological changes made by IBM as "de facto industry standards."



TOTAL roared to its first "500".
And its next "500" looks like a sure thing, too.

The TOTAL data base management system chalked up its first 500 users over a year and a half ago.

And its current 850-plus are just as enthusiastic about TOTAL and its unbeatable features.

Take Cincom's "pit crews", for example. The finest Systems Engineers and Marketing Representatives in the entire data processing industry. When information or service is needed, our people are right on the spot, ready to do the job.

And when the "oil slicks" of hardware came along — such as the tremendous number of changes in hardware over the past six years — TOTAL glided right along, unruffled.

This, of course, is because of all the "fine tuning" done on TOTAL by Cincom's resident software "mechanics"; and because of its unique and dynamic original design.

TOTAL has been given the checkered flag many, many times — and the user has been just as much a winner as the product itself. Give us a call, or drop a note to us real soon. Join the rapidly growing number who will soon make up the "Cincom 1000."

Let TOTAL give you the checkered flag of success.

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We create efficiency.

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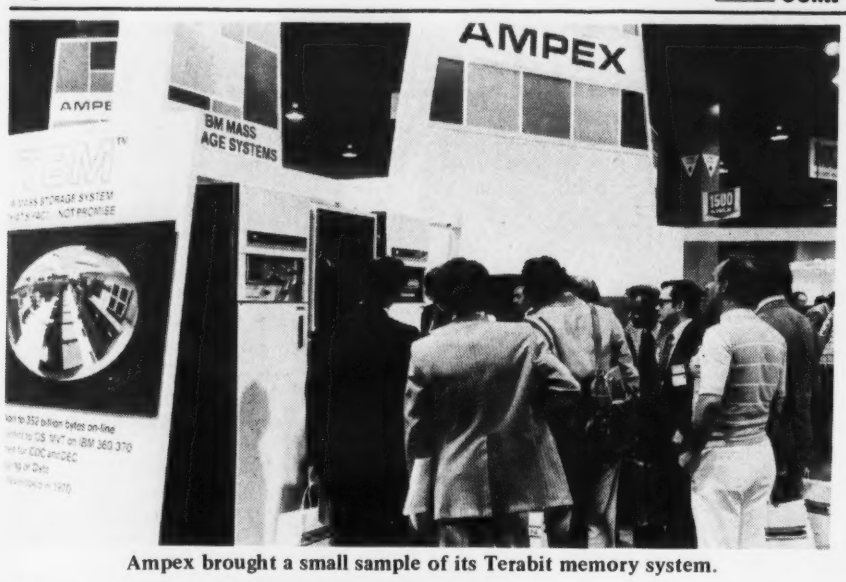
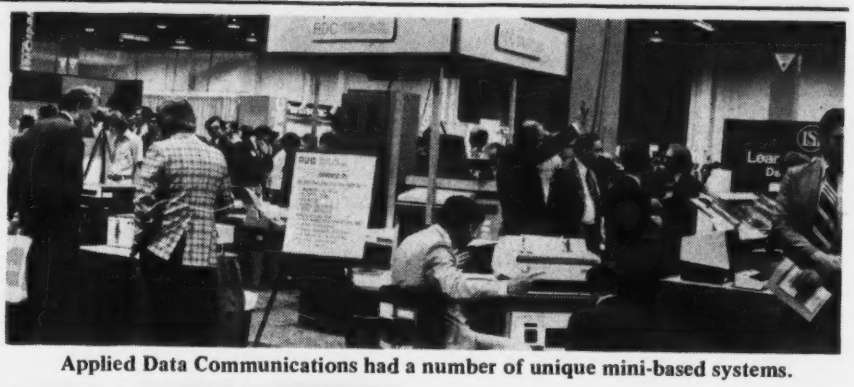
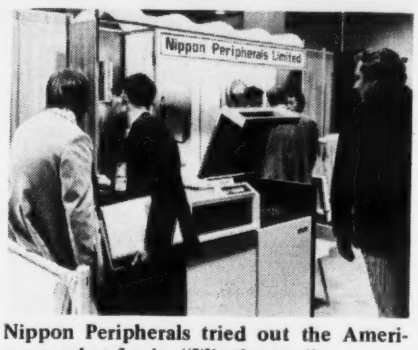


Ampex brought a small sample of its Terabit memory system.



Applied Data Communications had a number of unique mini-based systems.

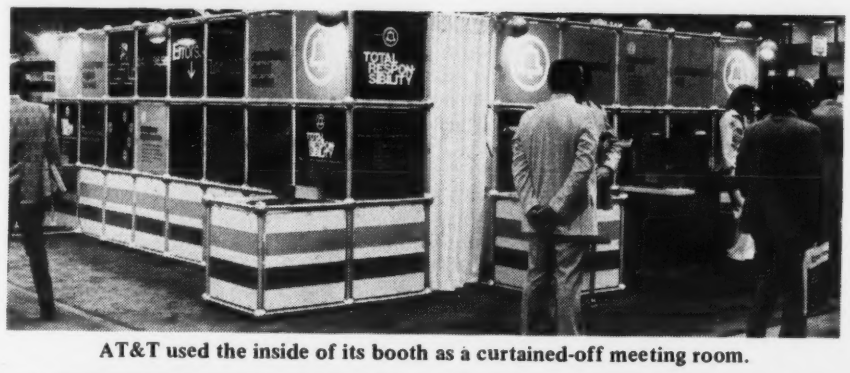


Nippon Peripherals tried out the American market for its "Winchester."

NCC at a Glance

CW Photo Feature
By Vic Farmer

Valcomp, computer overhaulers, raffled off an overhauled SDS 910.



AT&T used the inside of its booth as a curtained-off meeting room.

South Hall

North Hall

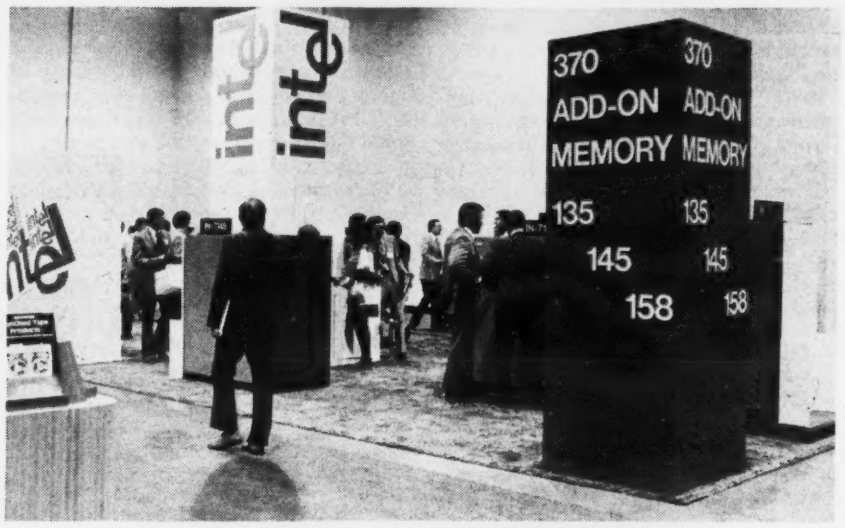
One highlight at Xerox was its 1200 electrostatic computer printer.

Card tricks attracted an audience for the Datum spiel.

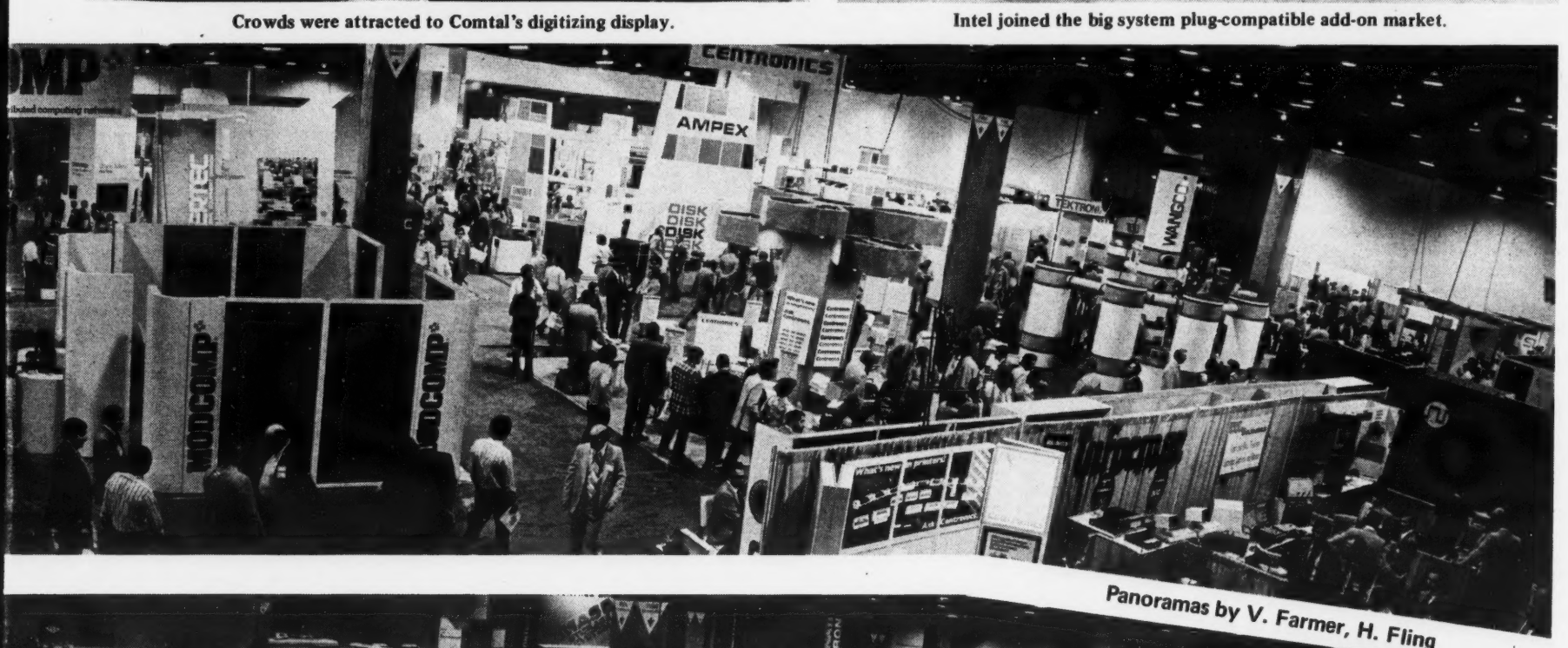
Peggie Clifton was the hit at the Information Terminals booth.

Pertec demonstrated its tape drives and floppy disk drives.

Crowds were attracted to Comtal's digitizing display.



Intel joined the big system plug-compatible add-on market.



Panoramas by V. Farmer, H. Fling

DPers Seen as Best Equipped to Handle World Issues

By Patrick Ward
Of the CW Staff

ANAHEIM, Calif. – The "background, traditions and heritage" of DPers make their discipline better equipped than the law, economics or politics to deal with the world's socioeconomic issues, according to Prof. Jay W. Forrester, keynote speaker at the National Computer Conference here.

In fact, "It's irresponsible to leave it in their [lawyers, economists, politicians] hands," he told attendees.

"We don't find within law, politics or economics any methodology for really understanding the long term," said the MIT professor and author of *World Dynamics*.

That book led the Club of Rome to fund a study that led to the widely discussed report, "Limits to Growth," which predicted disaster if present trends aren't changed.

There is compartmentalization everywhere within those professions, he said. During the growth period of this country, when resources were abundant, the nation could tolerate this narrow focus, in its government and industry, he said.

"But today goals are highly interrelated and the suboptimizing of the past no longer works," he stated.

The world is like a chemical processing plant that can't function if its operators try to do their jobs alone without cooperation, he said.

"No one is asking where the pieces fit together, where it all leads," he said. The result is frustration across the board from radical students to corporate executives.

Although he said this situation leads to short-term solutions that may only aggravate problems in the long run, Forrester said he is the "reverse of hopeless."

Computer Defines System

"The reason for this optimism is systems dynamics modeling, which takes existing human knowledge, descriptive concepts, puts them into quantitative form and then uses today's computer to define the real system," he said.

"These simulation models can unify a set of disparate observations," he said.

"We have entirely sufficient information to understand what's going on in social problems relating to economic growth," he said. Systems dynamics simulations may show those who use them their normal operations are exactly what are causing the problems they face, Forrester said.

These techniques trace back 100 years to early control devices, he said. "The area of feedback systems led to much of the early work with analog computers," he noted. Digital machines grew out of the inadequacy of analog machines for handling problems of control, he added.

Now, much more side use of systems dynamics simulations is becoming possible "because of the tremendous decrease in the cost of computation," he said.

Jay W. Forrester

CW Photos by V. Farmer

This reduction has been coming at about a factor of two every two years, he stated. Indications are that presently known technology will be able to guarantee that rate into 1990, he added.

While systems dynamics simulation remains a complicated business, it is not beyond the capabilities of current DP hardware or knowledge, he stated.

"Enough is known about the process of economic growth cycles to understand its whole," he said. But the DPers working with these simulations "must be interested in big issues and must not be afraid of the big view . . . at this turning point in history," he stressed.

Although government is already doing some studies of this type, Forrester said he expects the greatest impetus to come from privately done studies like *Limits to Growth*.

"If you are saying we ought to turn around and go in the other direction, you have no constituency," he said.

But, eventually, people will hear of the results of systems dynamics studies, and the conclusions will become "something that must be dealt with," he said.

Building National Model

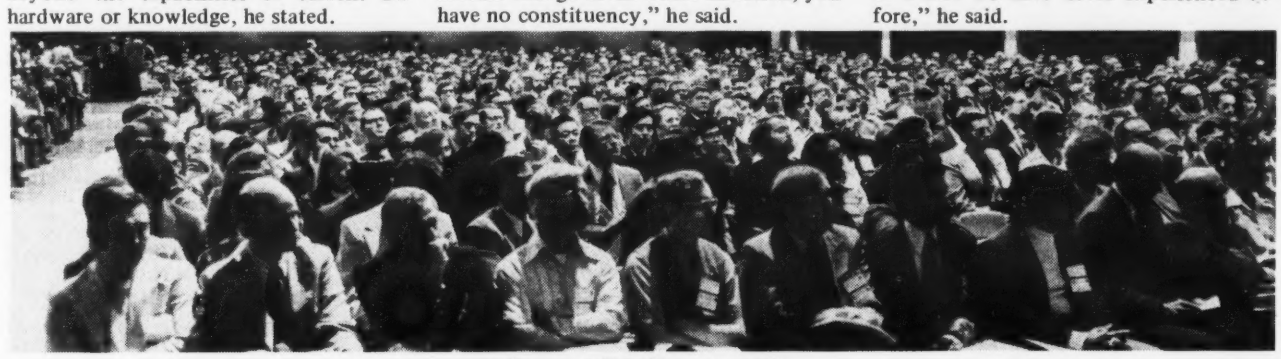
Forrester and his students are currently working on a "vast" systems dynamics national model. While only fragments have been developed so far, Forrester sees evidence business cycles are tied to employment and inventories, not capital investment.

He also indicated the model provides some evidence for the theory the West's economic cycle peaks every 50 years, with the most recent peak having been about 1970, he said.

"The whole idea has received little attention because people cannot understand how a cycle could extend over 50 years," he said.

He also indicated part of this country's current economic stress results from the past growth cycle moving into an equilibrium level, which is inevitable with rising population and shrinking resources.

"We are going to be facing crosscurrents of a sort we have never experienced before," he said.



Audience at NCC Keynote Address

NCCers Told User Needs Should Govern Products

By Pat Ward
Of the CW Staff

ANAHEIM, Calif. – "Today most users feel uncomfortable with computer systems so complex they defy understanding and frustrate management," according to Neil Gorchow, vice-president product strategy and requirements at Univac.

Vendors must learn to make their products less threatening, their software less complex and more flexible and their systems "more forgiving," he told an NCC luncheon conference.

"As an industry, we have not yet reached the point where user requirements govern our products, but we are making a start," he said.

This, more than any other factor, signifies the growing maturity of the computer industry, he said.

DP has also been around long enough to settle into the corporate organization, he said. Management no longer regards DP "as the pretty girl on the block" and is taking a more active interest in the DP operation, he said.

"Management today is asking the question, 'How much will it cost, not only to develop, but to run, maintain and change?' " he said.

And experience has taught corporate management that hardware is no longer the only DP cost, he said. Personnel costs take nearly 60% of the average annual DP budget, while hardware consumes only 30%, he said.

And application maintenance alone "absorbs nearly one half of the [user firm's] manpower time, effort and costs," he added.

Hardware Explosion

Fast technical advancement in hardware has brought DP into a "fourth generation" which includes LSI circuit technologies and solid-state memories, he said. In fact, the next five to seven years may surpass the past 20 in terms of hardware improvements, Gorchow predicted.

Main memory size/dollar has already increased nearly 50 times between first-generation 1952 to 1954 systems and 1975 machines, he said. Physical storage size has been reduced more than 800 times.

Processor performance/dollar has typically jumped 100-fold during the same period, he said. "It cost nearly $1.25 to execute 100,000 multiplications in 1954, compared with less than $0.01 in 1974," he said.

There have also been impressive breakthroughs in peripherals, he remarked.

While the traditional goal of good cost/performance won't be pushed to the background in future machines, the industry recognizes user needs for security and data integrity, he said. "Availability, reliability and maintainability" are other important goals, especially with the way computers and data communications are working in concert today, he said.

Software Dinosaur

But the "software dinosaur," as Gorchow called it, intrudes on this story of progress.

While high-level languages, better operating systems and the recent use of terminals have boosted programming productivity, there has been nothing to match the hardware "explosion," he said.

To continue its expansion into new application fields, then, the industry has to use "new hardware and software architecture and technology to increase programmer, operational and end-user productivity in both application development and application maintenance," he said.

Users will rely more on application packages in the future, he said, since developing software "takes too long and costs too much."

The packages will be either "interindustry" software, useful for a wide range of users, or "intraindustry" products that are optimized for use within a particular area such as manufacturing.

While hardware advances will allow users "to waste some of the computer power of the future to save the programming power of the future," users must be willing to get their organizations using "higher level languages, applications packages and generators, standardized file/data management methods and communications protocols" to get around the programmer productivity bottleneck, he said.

Bond Unites DP, Communication

ANAHEIM, Calif. – As corporate management in user firms gets more involved with DP, it is bound to notice the association between data services and communication services, according to Neil Gorchow, vice-president for product strategy and requirements at Univac.

Management will likely combine these two into a single entity, leading to an intensification of the bond between computers and communications, he said. "This will naturally lead to communications networks and a strengthening of distributed processing," he said.

The inflationary cost of people and services, the improved cost/performance ratio of computer hardware and a growing population of remotely located computers are all pushing for these concepts, he said.

There are two fundamental network architectures: the centralized star structure and the "ring" distributed network, he said.

With the star concept, communications lines link remote users to the single processing center. Because of economies of scale, the centralized network can economically justify "a more elegant software system than can a set of smaller computers and, hence, can provide more sophisticated user services," he said.

The ring distributed architecture consists of a communications network connecting various processor "nodes," he said.

"Any node might communicate with any other node directly, without going through a chain of command," he said. He gave the Arpa net as an example.

Because the nodes are independent entities, the structure should be less vulnerable to catastrophe, he said.

"It is reasonable to predict the trend in the future would be various ring/star networks which combine the advantages of both," he said.

'A Veritable Cornucopia'

NCC Real Treat for Users Of Minis, Small Systems

By Vic Farmer
Of the CW Staff

ANAHEIM, Calif. – NCC was a veritable cornucopia of goodies for users of minicomputers and small systems. Interfaces, peripherals, dedicated systems and the like flowed like a bountiful harvest.

Decision Data Computer Corp. expanded its line of products for System/3 users with a 300 line/min and a 600 line/min printer that can directly replace IBM's 5203 and 1403 models now used on System 3/10.

Full line buffering within the printers' interface was said to reduce CPU overhead and bring increased system performance over the IBM 5203 printer on processor-bound applications. The 6603 has a 300 line/min speed while the 6606 has a 600 line/min speed.

Decision Data Printer Speeds

Rated speeds for the printers are attained when printing a full 63-character set over a 132 print position line.

Monthly rental prices for the 6603 and 6606 printers, including maintenance, range from $410 to $825. Purchase prices range from $18,150 to $25,220. These prices represent between a 25% and a 48% savings over comparable IBM equipment, the firm said.

Accounting Feature

In addition, the firm added an accounting feature to give arithmetic capabilities to the firm's card-oriented data entry and communications systems.

Both versions have eight 16-digit accumulators, as compared with only three in IBM 80-column models and none in IBM 96-column data recorders, the firm said. The accounting feature also has the ability to combine operation with the company's line of data reporter printers providing formatted reports with up to four levels of totals.

Users of the accounting feature are said to be able to improve operating control by balancing work to predetermined totals, creating proof or cash totals for cards previous to their use by the computer and crossfooting to check or create field totals. Reduced data entry costs also result from minimizing card fields to keypunch or verify, and there are fewer errors to correct, the firm said. Monthly rental is from $25 to $45; purchase is $1,100.

Card Converter

Conversion of 96-column to 80-column cards without the aid of a computer is now available with the firm's 1090 card converter, a 96-column card reader interfaced to a Decision Data 80-column data recorder.

Conversion to 80-column punched cards runs at rates up to 75 card/min. The reader has a capacity of 600 cards.

For installed, 96-column, card-based System/3s or other computers, the 1090 converter feature permits the use of two types of cards in the installation as it provides conversion of information received from customers or generated by the System/3, the firm said.

Monthly rental prices, including maintenance, range from $92- to $127/mo. Purchase price is $3,960 from the firm at 100 Witmer Road, Horsham, Pa. 19044.

CFI Add-On Memory for System/3

CFI Memories, Inc. introduced its 4K add-on memory for the IBM System/3.

The add-on module is available to System/3 users for $85/mo rental, including maintenance. Users also are supplied with a software card deck and documentation to permit faster systems changes that are said to cut average system generation time from about two hours to 15 minutes.

Using the CFI 4K module means System/3 users can have a 20K system for $746/mo total cost, according to the firm.

CFI Memories is at 305 Crescent Way, Anaheim, Calif. 92801.

GA Time-Sharing System

General Automation, Inc. (GA) extended the capabilities of its DM 200 Series of data management products with the DM 250 time-sharing system. It provides more powerful on-line processing features than had previously been available with these batch-oriented systems, but retains compatibility with the library of existing applications software.

The DM 250 handles 16 terminals in a virtual-memory environment.

The system can accommodate batch processing, on-line time-sharing and real-time operations concurrently under a range of variable load conditions. The DM 250 provides for concurrently asynchronous and bisynchronous communications for low- and high-speed data transfer respectively, GA said.

It supports Fortran, RPG-II, Cobol, Basic, Assembly and APL.

DM 250 systems also have peripheral spooling, which maximizes the efficiency of input/output operations and reduces core memory overhead, the firm said.

A minimum DM 250 configuration, including a GA 18/30 CPU with 16K words of core memory, a 10M word disk, a 300 line/min printer, a 400 card/min reader, a teletypewriter and basic software, is priced at $74,200. Up to 16 CRT terminals, each priced at about $4,000 with controllers, can be added.

GA is at 1055 S. East St., Anaheim, Calif. 92805.

Prime 31-User T/S System

Prime Computer, Inc. introduced a 31-user version of its Prime 300 time-sharing system.

The system, equipped with 512K bytes of MOS main memory, floating-point arithmetic hardware, 32-line asynchronous multiline controller, line printer and 60M-byte disk pack, can be purchased for less than $5,200 per user.

Each user is provided with a 128K-byte virtual memory space and full access to all peripheral devices directly from a user terminal, the firm said. Each user can also write programs in Fortran, Basic, Macro and Micro Assemblers.

Prices range from under $50,000 for a four-user system to approximately $165,000 for a 31-user system.

Disk Controller

A universal disk controller is said to simplify the configuration of mass storage units used with all Prime time-sharing systems. Any mix of four cartridge or disk pack units with capacities of 6M bytes, 12M bytes or 60M bytes plus a fixed-head disk can be attached to a single controller.

The controller also assures economical expansion since additional disk units can usually be added to a system without having to purchase additional controllers as well, Prime said.

Prime's virtual-memory disk operating software also includes several new features to improve the efficiency of multi-user systems: an automatic log-out feature prevents inactive connected terminals from holding system resources beyond a predetermined time limit; a read/write lock system for file security controls user access to all files through a system of file access control keys; a main memory scan feature automatically tests the computer's main memory and can identify and bypass any faulty locations.

Prime is at 145 Pennsylvania Ave., Framingham, Mass. 01701.

McDonnell Douglas Shows 'Mavis'

McDonnell Douglas Electronics Corp. exhibited its automated voice information system which permits the entry of data by a touch-tone telephone and responds with a voice presentation of data generated by the computer, either through a phone or a speaker in a CRT terminal.

Called Mavis, the system offers data key-to-disk entry and IBM 3270 simulation and batch processing in addition to voice response.

The voice development is an outgrowth of early research into cockpit voice warnings systems for aircraft, according to the firm. McDonnell Douglas developed a means for analyzing and compressing speech, first digitizing the analog waveform and storing the resultant data in a computer for further processing.

Compression programs are then used to extract the essential phonetic elements of the stored speech, retaining only those elements necessary for intelligibility.

The resulting "compressed speech" can be stored in one-tenth to one-hundredth the computer memory volume required for the original digitized speech, the firm said.

The Mavis voice now in use is that of a speech therapist who has been trained to speak in monotone, thus further reducing storage requirements and simplifying programming.

Mavis can accommodate up to 256 telephone lines in simultaneous operation, with no queuing delays, the firm claimed.

A system with 2314-type disk, 9-track tape, four CRTs, 256 K-byte memory and eight phone line interfaces is priced at $130,000 from the firm in St. Charles, Mo.

Centronics Products

Centronics Data Computer Corp. announced a number of printers, interfaces and teleprinters.

The Model 103 and Model 503 intelligent printers are designed to meet the needs of the billing, accounting, warehouse and inventory environments which require columnar or forms data which have a low to medium line density. These 132-column machines print at 165 char./sec with bidirectional throughput, and the print head intelligently seeks the nearest character on the next print line. They can achieve throughputs of 70- to 380 line/min, according to the firm. One 103 is $4,340; a 503 is $3,465.

The demand in the material handling, warehouse, freight, transportation, automotive, retail and food products for a printer that would combine normal or OCR printing, bar codes, large block letters and condensed printing led to the development of the Model 306SC printer, according to the firm.

The large-size letters, numbers and bar coding can be produced in addition to the normal computer printout required. A 306SC is priced at $3,500.

The firm is also providing off-line loading and remote batching in a magnetic tape cartridge, in its Model 308MSR, 80-column and Model 508MSR, 132-column send/receive communications terminal.

Both machines print at 165 char./sec. The magnetic tape cartridge can store up to 122,000 characters of data which can be transmitted at higher speeds of 9,600 bit/sec.

The MSR feature is priced at $1,608 for one.

A microprogrammable communications interface interfaces Centronics printers to almost any computer through use of interchangeable read-only memory. The in-

(Continued on Page 10)

CW Photos by V. Farmer

One of the interesting features of Decision Data's 6606 printer – being loaded with paper here – is a small fluorescent light in the housing that illuminates the paper just above the print head.

GA's 250 time-sharing system allows up to 16 users.

Minis, Small Systems a Treat at NCC

(Continued from Page 9)

terface is priced at $1,350.

A recently introduced line buffer stores 160 or 280 8-bit characters and the buffer can be loaded while the machine is printing. This line buffer is $475.

Centronics is in Hudson, N.H. 03051.

CDC Page Reader

A page reader that provides optical character recognition capability for a wide range of terminal-based and minicomputer-based system environments was announced by Control Data Corp.

The CDC 92650 terminal OCR page reader can be included with intelligent terminals, communications systems, key-to-disk data entry equipment and computer systems, CDC said.

The reader optically scans typed pages of information and identifies, using its internal line-search logic, those lines that contain needed information. The unit then converts typed letters and numbers to digital data and transmits it at a rate of 683 char./sec.

Standard or custom-designed communications modems can be used, and the reader recognizes information prepared in standard OCR-A or OCR-B upper-case alphanumeric format.

The basic CDC 92650 is priced at $10,000 in quantity.

CDC also announced the 150M-byte CDC 9764 and 300M-byte 9766 disk drives that will be offered to designers of small business systems and minicomputer-based systems.

The high storage capacities are achieved through use of the firm's 12-disk pack, the 9883, that contains 404 or 808 tracks on each of the pack's 19 recording surfaces.

A full functional equivalent to IBM's "Winchester" data module drive and alternatives to the 3348 data modules were also announced by CDC.

The products, designed for original equipment manufacturers, include the CDC 9770-B2 data module drive and CDC 9778 series data modules.

One module has a data storage capacity of 35M bytes on two disks. The second uses four disks to store 70M bytes of information, while the third uses 30 fixed elements (10 heads with three elements each) to access a half-million of its total 70M-byte capacity.

Datum Enhancer I

Datum, Inc. revealed its Enhancer I minicomputer – a full plug-to-plug replacement for GA's SPC-16. Besides serving as an alternative source, the mini is said to provide some cost advantages – but Datum has yet to place a firm price on the mini.

The mini was installed at systems in several other booths at the show, however.

The firm did announce a "Quad" density (100-, 556-, 800-, 1,600 bit/in.) 1/2-in., 7-track and 9-track tape drive controller that is said to be software-compatible with most popular minis. Using MSI/LSI circuitry, the controller can handle up to four tape drives and is priced at $5,550.

An IBM 3330-type disk drive controller from the firm uses heavy microprogramming to achieve software compatibility with most minicomputers.

A duplex option allows two minis to access the system and the controller is priced at $20,000.

Datum also announced a 3M cartridge tape system which also interfaces to most minis. The system uses existing 1/2-in. tape software, and a two-drive system is priced at $4,500.

Datum is at 1802 N. American St., Anaheim, 92801.

An add-on core memory by Cipher Data Products has 16K of memory on a single board and is said to be fully compatible with any existing Digital Equipment Corp. PDP-11.

Two module positions are needed for the model, called the MEM-11-16K. It plugs directly into any PDP-11/05, PDP-11/35 or PDP-11/45 backplane and

(Continued on Page 44)

The voice in the McDonnell Douglas data response inquiry system is compressed to take up less space in memory.

CW Photos by V. Farmer

Centronics 503 printer has bidirectional printing.

Introducing Sycor's intelli

Our new 500,000 character, dual flexible disk option offers Sycor 250 users the best of two worlds: the storage capabilities of a batch terminal with the inquiry/response features of an on-line terminal.

An on-line/batch terminal.

Use the Sycor 250 like a batch terminal. Store non-critical data on the diskettes during the day and transmit it to the CPU in batches. Data can be processed at night and sent back, unattended, to the diskette for printing the following morning. And the system lets you continue entering data even during computer or line outages.

Store formats and programs locally.

For inquiry/response applications, you can store an unlimited number of formats right at the site, instead of being on-line all the time to the CPU. So you leave the line free for more critical traffic.

Or you can store your own program locally. Using our Sycor 250's simple, yet sophisticated FIL language, you can cut line time further by catching operator errors on the spot—instead of at the CPU.

All of which means that you end up using that expensive communications network more efficiently. So

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Classic IQ Theory Refuted by Modeling, Session Told

By Nancy French
Of the CW Staff

ANAHEIM, Calif. – The classical theory attributing IQ directly to genetic inheritance has been hotly disputed by environmentalists who support social programs, and a study discussed at an NCC session on social impact by Marcus Feldman of Stanford University's Department of Biology indicated the classical theory may not be sound.

Geneticists who believed 70% to 80% of a person's IQ can be directly attributed to genetic factors have been challenged by Feldman's research, which indicated IQ as well as cultural character are transmitted not only by parents but also by members of the group to which parents belong, i.e., environmental factors.

Through computer modeling, Feldman showed there is an interaction between biological and cultural processes in transmitting intelligence and cultural characteristics.

"In the classical theory of biometrical genetics, the genes determine the phenotype, or external manifestation of an individual. The effect of the environment is expressed by one or more constants, but the interplay of gene type and environment is not recognized as a dynamic factor," he said.

The computer model Feldman discussed included genetic variation, he said, from the extreme of pure cultural transmission, on the one hand, to pure biological transmission, on the other.

Using accepted statistical techniques, the Stanford project team calculated the phenotypes for various parent-offspring combinations as well as those of adopted parents and offspring and twins reared apart.

The team concluded that, indeed, different environments can produce different phenotypes nearly as much as differing amounts of water affect the appearance and health of a plant, Feldman said.

"A fraction of the teaching/learning process takes place through parent-offspring interaction, and another fraction is affected through age-peer, or teacher-pupil interaction.

While Feldman believes the phenotype of an individual, including IQ, can be the consequence of a long and complex learning process, the problem needs further study, he said.

Short Courses, Undergrad Minors Often Forgotten in DP Education

By Nancy French
Of the CW Staff

ANAHEIM, Calif. – Amid the controversy that accompanies discussions of computer science education, people often forget the role played by continuing education programs and minors within the undergraduate curriculum, NCC participants at a technical session on education heard here last week.

The short course is the most popular of the three options within the typical continuing education scheme, according to Walter Karplus, chairman of the University of California at Los Angeles' Continuing Education Department.

"It holds great advantages for the student, the educator and industry alike because it permits the student to get away from his job for what seems like a week's vacation and meet people with similar interests. When he returns, he becomes the resident expert," Karplus said.

It is also lucrative for the school and the teacher because typically the short course is company-paid, he added.

The short course satisfies the student's desire for "depth" or learning all there is to know about a given topic at a given point in time, he said. "But the short course should not be confused with education," he joked.

Typically the student rushes to clean up the loose ends at his job before arriving for the course without preparation and is more than likely uninformed about the level of the course, Karplus said.

Attending classes seven hours a day for a week, the student soon reaches "the saturation limit" that "reduces the amount of information he actually retains," he said.

The short course can be made more effective by having the students prepare in advance through a reading list of books or asking him to review some of his college work. The company paying for the course could help by making work time available for this purpose, Karplus suggested.

Undergraduate Minor

Another technique of providing training in computer science without an entire major program is the undergraduate minor, according to Gerald N. Pitts, professor of computer science at Texas Technological University, Lubbock.

"When you read surveys and hear the talk about the number of jobs there are in the computer industry, you find they're not really jobs for computer scientists. Many are computer science-related jobs.

"Two hundred thousand such jobs went begging in 1975," he said.

"These computer-oriented jobs are on the fringe areas – accountants, for example, who are using computers to do accounting," he said.

"We need to train people like this as a complement to computer scientists," he added.

The interdisciplinary minor in computer science allows a student majoring in anything at all to take 18 to 24 hours of computer science courses, he said. At Texas Tech, the course content and applications of the computer science portion of the program is oriented toward the particular major the student is taking, Pitts explained.

One course should be a project course where the student would work on a real life problem for an actual company. The relationship built up by the student with the members of the company "helps get the school more applications, and the employer might even hire him," Pitts said.

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Terminals Carry the Day For Communications Users

By Ronald A. Frank
Of the CW Staff

ANAHEIM, Calif. – Terminals and more terminals were the order of the day at the National Computer Conference here last week as exhibitors and visitors discussed ways to get more power out of their communications-oriented systems.

Logabax S.A., a French supplier, introduced one of the first teleprinter replacements for the recently introduced IBM 3767. The matrix-printing terminal operates at 180 char./sec compared with the top speed of 80 char./sec for the 3767.

The Logabax teleprinter features 10 prerecorded "message keys" which can store up to 16 characters each in a buffer, operator-controlled slant printing and a 40K char./sec transfer rate from a 256-character buffer storage.

Called the LX 180/KSR, the terminal costs $170/mo on a one-year lease compared with the cost of $223/mo for the 3767, according to a Logabax spokesman.

The company also showed its LX 180/57, a replacement teleprinter for the IBM 2740 Model 2. The unit costs $199/mo compared with $240/mo for the IBM terminal; the Logabax terminal prints at 180 char./sec while the 2740 is limited to much less, a Logabax spokesman said.

The Logabax terminals have been available in Europe for some time, and U.S. delivery is 30 days with support provided by third-party maintenance firms. The company is at 10889 Wilshire Blvd., Los Angeles, Calif. 90024.

Interface Technology, Inc. of St. Louis, Mo., showed its Model 731 desktop Touch-Tone terminal which costs $650 and is desigend for audio response applications such as credit authorization.

The terminal includes a 16-character LED display, a 16-key keyboard, an access connector for hard-wired connection through a Bell CDT Data Access Arrangement and a built-in amplifier.

Beehive Terminals of Salt Lake City introduced its "Brilliant Bee," which it described as a programmable intelligent video display computer rather than a terminal. The device contains a 16-bit microprocessor and costs $5,945 without peripherals.

Included with the display are options such as printer graphics ($400); CRT graphics ($400); expansion with a buffer terminator; and a serial asynchronous interface. The system is described as being compatible with Data General gear and deliveries are available in 90 days, a spokesman said.

Applied Digital Data Systems showed its MRD 400 series of video color display generators. The MRD 460 displays 24 lines by 80 characters and drives a 525-line color video monitor, while the MRD 450 displays 32 lines by 80 characters and drives a 625-line color monitor.

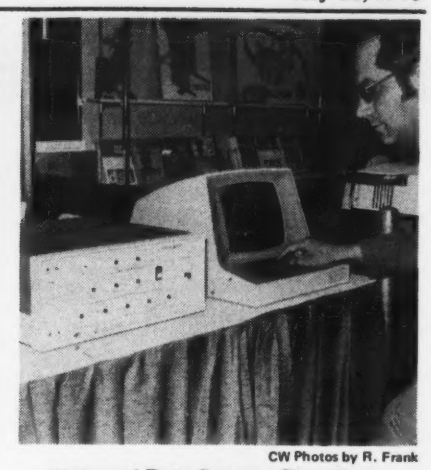
The units are priced at $3,800 and $4,200 respectively. A serial interface is available ($100) in addition to a keyboard ($100). First deliveries are set for July from the company in Hauppauge, N.Y.

Keronix of Santa Monica, Calif., showed a video display terminal with a 4,000-character display that it described as having twice the capacity of other terminal screens. The unit is field-upgradable to an intelligent interactive system with the addition of a microprocessor.

Interfacing to most minis, the unit is RS-232-compatible and software is available for the Data General Nova. The basic terminal costs $1,490 with first deliveries in July.

Data Terminal & Communications introduced a floppy disk "Micro-File" which it said could be added to any Ascii asynchronous terminal operating at speeds up to 4,800 bit/sec. Two models were shown, a single floppy disk version at $2,750 and a dual floppy unit at $3,250. The firm is based in Campbell, Calif.

Logabox Teleprinter



CW Photos by R. Frank

Universal Data Systems Data Trap

TEC, Inc. showed a single floppy disk storage unit that can be added to an RS-232 CRT and costs $2,995. The unit includes a 160-character buffer and is available in 90 days from the company in Tucson, Ariz.

TEC also showed a lower-case display capability which it added to its Mini-Tec display. The terminal with lower case costs about $1,800 and can be installed in the field on earlier models for about $150 to $200, a spokesman said.

In the communications area, Timeplex of North Hackensack, N.J., introduced its Dynaplexer which combines the functions of a remote concentrator with the capabilities of a multiplexer and switching unit.

The drive features forward error correction, which is said to provide three orders of magnitude improvement over conventional transmission error rates.

The Dynaplexer can automatically adapt input ports to varying data speeds, thereby eliminating CPU programming and conserving bandwidth. The unit can handle from 16 to 256 input channels.

A basic 16-channel system costs about $15,000. Two Dynaplexers are used in a typical net with one at the host CPU site and the other at a remote net collection point.

Universal Data Systems, Huntsville, Ala., introduced its data trap diagnostic unit, which is used with a CRT to display the data transmitted by the transmit and receive side of a communications line.

The operator can select any trigger character pattern to monitor up to 70 characters on the display screen.

The unit costs $3,950 without the terminal and is available in 30 days.

Codex Corp. of Newton, Mass., showed its Line-Sharing Unit designed for multipoint star networks. The device cuts down on the number of lines required in a network by allowing remote terminals to operate in contention behind the sharing unit.

On a transmission out from the main site, a single line would be used to the Line-Sharing Unit and all terminals would receive the data in broadcast mode.

For Optimal Information Capture

'Image Transfer Devices' Predicted for Bank Nets

By Ronald A. Frank
Of the CW Staff

ANAHEIM, Calif. – The optimal way to capture branch bank transactions for on-line nets will be with "image transfer devices" that can optically capture information from the base portion of documents.

But before this type of technology can be adapted to on-line banking networks, some basic problems have to be solved, according to David Harris of IBM Corp.

The benefits to branch banks from a conversion to on-line systems include greater labor productivity, better customer service and increased information quality, Harris told an NCC session last week on the implications and applications of communications technology on banking.

With present optical techniques it is necessary to capture all information on a document. This makes it impossible to utilize data compression methods which selectively drop noninformation bits, Harris explained.

The only way to capture a limited amount of data is through the entry of transaction information from keyboard terminals with an operator. This makes it possible to employ data compression techniques, which cut down on transmission costs.

Most customer bank terminals currently in use are automated teller machines (ATM) which capture relatively simple transactions. This type of operation will become more complex as the public becomes more familiar with the equipment, Harris predicted.

Second- and third-generation ATMs will greatly increase the types of transactions which the consumer can complete by himself.

Among these ATMs will be terminals that issue travelers' checks and money orders in varied denominations. They will also accept third-party payments to utilities and merchants.

Ultimately, the ATMs will include a display capability combined with some type of hard-copy reproduction that will allow the bank customer to prepare his own monthly statement, Harris said.

Many of these more sophisticated capabilities are waiting only for a larger number of card-carrying ATM users which will make it economically feasible, he said.

Hopefully, electronic funds transfer systems (EFTS) nets will reduce the amounts of paper in transit at any one time. An ideal way to transmit check information would be to scan both the front and back of checks instead of sending them from bank to bank.

The net effect of such information transmissions will probably reduce the amount of documents in transit, although the exact numbers are not yet known.

But if bank documents were scanned with optical image transfer devices, wideband data links would be required. The required bandwidth would range from 1 Mhz to 5 Mhz and is currently available in community cable TV systems, he said.

Bank terminals today are "consumed in reformatting their data" so there is great pressure to arrive at workable standards, according to Robert Wainwright, a consultant who also spoke at the session.

About 80% of the code written to support current terminals is designed to allow for "abnormal situations," he said.

An EFTS terminal net can ill-afford to lose data depending on the application which establishes the priority. Inquiry response transactions are the least vulnerable because the data can be reentered by the terminal operator, he said.

Administrative messages cause more of a problem when the information is lost; previously captured transaction data must be preserved as a system goal, he said.

Standards Crucial to EFTS

ANAHEIM, Calif. – Today's banking terminal systems are as complicated as IBM 360/30 systems, and some of them contain up to 10 I/O modules with 32K of storage inside the machine.

These systems are designed to handle three basic types of banking transactions, including bank to bank; merchant to bank and individual to bank, according to Pat Payne of IBM.

Speaking at an NCC session on the impact of electronic funds transfer systems (EFTS), Payne said IBM's System Network Architecture (SNA) is a method for users to find a better way to support mixed-terminal environments.

A key portion of the concept is Synchronous Data Link Control, which Payne described as a way to accommodate increased data traffic and is "a step toward satellite communications and broadbank networks."

IBM has thus far introduced about 35 terminals with SNA capability, and each is designed to operate in a specific user environment while also interfacing with common line control, he said. One major requirement of banking networks is that a common algorithm is carried through to all locations, Payne said.

Another session speaker, Barry Wessler of Telenet Corp., agreed standards would be crucial for the proper implementation of EFTS networks. Common communications protocols must be set, but, at present, various groups are setting standards, and they are not talking to one another, Wessler told the attendees.

Among those he cited as studying EFTS networks were the American Banking Association, the thrift institutions and bank card chains. In many cases there is a duplication of effort, he said.

Regulation of EFTS networks will be a problem because both banking regulatory agencies and communications regulatory agencies are involved. There may well be "regulatory jurisdictional disputes" before the important issues are settled, Wessler said.

The communications portion of EFTS nets will be sensitive to privacy compromises, and it will be difficult to assure protection at this level.

Instead, this protection will have to be included at the mainframe with CPU procedures designed to protect the privacy of data and also guard against potential fraud.

Network failures can be catastrophic in EFTS nets, but the potential for these can be overcome with proper planning, he said.

NCC Attendees Advised on 'Making Computers Safer'

• Privacy Costs Extremely High But Said to Be 'Worth Every Cent'

By Toni Wiseman
Of the CW Staff

ANAHEIM, Calif. – The cost of computer privacy can be distressingly high, but it's worth every cent, attendees at an NCC session on "Making Computers Safer Through Technology" were told last week.

The results of a test project sponsored by Honeywell Information Systems (HIS) in conjunction with a Harvard University doctoral candidate showed the cost for initial system compliance (compliance with proposed privacy legislation) for a computer installation may range from 11% to 512% of the original implementation cost. Operation costs may add another 11% to 222% to the original implementation cost, according to HIS' Jerome Lobel.

The average annual cost of compliance per subject for six test sites varied from 57 cents to $6.97, while the average cost per compliance transaction varied from 15 cents to $9.64, he said.

But cost alone is not the basis for an analysis of the impact of proposed legislation, Lobel emphasized.

"Cost does lend perspective to the overall difficulty of compliance," he said, "but it is clear that several of the most expensive regulations appear to offer the most protection to the individual and therefore should not be abandoned for cost reasons alone."

Lobel's figures and comments were the result of a computer simulation study on the impact of a large set of possible regulations on the personal data system of six typical computer user organizations. The test sites included a hospital, a law enforcement agency, a criminal history system, a consumer credit organization, a personnel system and a casualty insurance company.

The model, Lobel said, contained 20 legislative proposals culled from bills pending in Congress and under consideration in 23 states, as well as from existing laws and industry literature.

Regulatory requirements included supplying individuals with the knowledge that data on them is being compiled; supplying individuals, upon request, with a record of inquiries into the data; and the maintenance of a usage log.

The regulations with the highest continuing costs, according to Lobel, were record existence notification, data accuracy inquiry, record use inquiry, physical security and system assurance.

Is the increase in privacy worth the cost? "In all probability there will be some significant reduction in business and government efficiency," Lobel admitted.

"But if legislation is carefully worded to allow grace periods for compliance and exception-oriented responses," he said, "privacy legislation can be both tolerable and beneficial."

From the industry's point of view, privacy legislation provides both a challenge and an opportunity, Lobel maintained. "Equipment suppliers will realize opportunities for new equipment (such as user and terminal identification devices), larger and faster direct access storage devices and more secure computers featuring better access control mechanisms," he said.

• Auditors Should Be Involved Early in Project Development Cycle

By Don Leavitt
Of the CW Staff

ANAHEIM, Calif. – Auditors should be involved very early in the development cycle of any major DP project to make sure good controls are in place, but the auditor has to tred a very narrow line and must not get emotionally involved in the project.

That is the two-pronged problem faced by auditors working to make DP operations safer, according to independent auditing consultant Naomi Lee Bloom. The things DP types are interested in building into a system often don't require an audit trail, she told an NCC session on "Making Computers Safer Through Auditing."

In the old days, when batch systems were being developed, auditors were often asked to check a new application for controls after it was tested and ready to go operational. Implementing controls at that stage of the project was possible but costly.

With the more complex systems being built now, retrofitting of controls may not even be possible, she said.

A Lonely Person

The computer audit specialist has to be a very lonely person, commented James Forshay of Eastman Kodak, who told the attendees the specialist must have a neat balance of talents and experience along with the knack of not getting involved in the project being audited.

The specialist needs a solid internal auditing background with two years of experience and introductory, intermediate and advanced courses in accounting principles. Data processing experience is also important, but Forshay wasn't able to categorize the specifics the specialist should have accumulated in that time.

Even more important is an "auditor's instinct," he said, and this entails an attitude that accepts nothing at face value. "It's hard to define, easy to sense in a person. They either have it or they don't," he went on.

The specialist must be able to talk to DP personnel so he won't get "snowed" by the jargon of programming, but must also have enough organizational experience to have respect for the company's management and a knowledge of its operating procedures. The more complex the DP project, however, the more important becomes the auditor's DP background, Forshay admitted.

The DP staff, in turn, must encourage the participation of the auditors, providing training on any new programming or operating system features, Forshay added. And the computer-oriented staff should listen to the auditor's questions and comments since he can provide an independent view of the project under development.

Sense of Control

Though the auditor may not be an effective programmer, as an independent he can provide a sense of control overlooked by those too close to the project to be objective. A review of proposed test data might make debugging sessions more effective, and controls outside the DP area – which the auditor should know well – may put restrictions within the program in new perspective, the speaker said.

Norman R. Nielsen of the Stanford Research Institute moved the discussion away from the specific duties of the computer audit specialist with a recap of the reasons for increased concern for security in today's computer systems. He noted, for example, that the computer center itself and the data are both targets, and using companies are more dependent than ever on the computer to keep them in business.

Physical security, access control, operating procedures, programming personnel and recovery procedures must all be concerns of the auditor in his expanded role within a computer center, Nielsen said.

But, at the same time, the computer itself has become a more effective tool for the auditor, he said. Audit software is now commonly available, but auditors have also learned the value of setting up dummy branches of divisions within a company to exercise a system in a regular, day-to-day way.

Need for 'Currentness' in Certification Stressed

By Edward J. Bride
Of the CW Staff

ANAHEIM, Calif. – The "currentness" of DP certification seems to have surpassed the licensing issue as a concern of computer practitioners, if only because of the nearly unified front against licensing.

While the Society of Certified Data Processors (SCDP), which represents 750 of the 14,000 holders of Certificates in Data Processing (CDP), continues to espouse the licensing concept, most questions asked of panelists at an NCC session here last week on "Making Computers Safer Through Licensing, Certification or Professional Responsibility" dealt with improving the certification exam and continuing self-assessment.

"If certification itself has any meaning, then current certification is appropriate," commented Fred Harris, vice-president of the Institute for the Certification of Computer Professionals (ICCP).

In a related note, Harris also commented that being current is a function of whether a person still practices in his field.

For example, Harris' doctorate is in physics, and "the fact that I am an obsolete physicist has little bearing" on his ability to function as director of the computing center at the University of Chicago, he said.

Asked whether people who passed the CDP exam 15 years ago would fail the exam today, Gary Casper, representing SCDP on the panel, said "it is a mistake to assume" that people who obtained their certificate in 1960 have not kept up with computer technology.

But there was no general agreement on a method for ascertaining current expertise in the computer field, an especially difficult problem because most people have focused their efforts in one area since passing the general test, panel members agreed.

Licensing was by no means avoided by panel members or by the audience; most people seemed to agree that some form of regulation of computer professionals is a certainty.

The precise form of regulation seemed the only debatable issue. Some audience members noted the passage of privacy legislation will have a direct impact on DP practitioners, while others were concerned with peer group vs. legislated pressures for proper practices.

Mary Ann Chapman, representing the Association for Computing Machinery (ACM) ombudsman effort on the panel, predicted regulation such as that practiced in the accounting field, where a person can begin as a practitioner, then work up to more responsible positions which require certification and licensing.

A licensed DPer, she said, would have the credentials to certify that systems would perform the tasks for which they were designed, fulfilling privacy requirements and assuring data integrity.

Chapman also noted the current controversy seems to revolve on whether impending regulation of computer people is to be by peer group pressure or legislation. The fact that laws have been introduced in some states is accelerating this controversy.

One member of the audience, which numbered around 200, drew a spate of applause when he said that, instead of debating licensing and certification, computer people should put pressure on practitioners who don't document systems, who don't debug systems and who don't use standard languages.

Harris responded by saying current certification exams can at least measure the applicant's awareness of these terms and standards, while today many programmers are not aware of two-thirds of the terms used in the above statement.

The whole issue is clouded by uncertainty over who should be concerned with these issues, according to Walter M. Carlson, a past president of ACM who helped form ICCP.

Speaking from the audience, Carlson claimed the consfituent societies of the American Federation of Information Processing Societies (Afips) are supposed to be technical, not professional, associations. By being overly concerned with these "professional" issues, societies' charters could be in jeopardy, he said, apparently referring to the nontax status of technical groups.

If there was any agreement among the panel members, it appeared to be on the issue of recertification: it is needed, but nobody had an answer on how to implement it or to provide incentives.

Chapman suggested the use of the initials "CDP" after a person's name be appended only when individuals add the year they achieved the CDP status.

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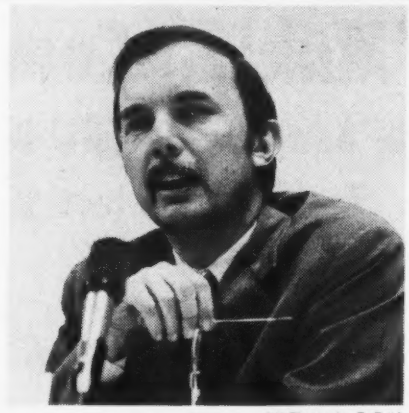
Richard G. Mills



CW Photos by E. Bride

Lewis Branscomb

Providers, Not Customers, Should Pursue Technology

By Edward J. Bride
Of the CW Staff

ANAHEIM, Calif. – "We can no longer afford to do everything with the hope some of it will be useful," according to Richard G. Mills, vice-president of First National City Bank, New York.

This theme, along with the claim providers, rather than users, should determine the efforts in new technology, dominated a session of NCC chaired by Mills, called "Technology Transfer: A Smouldering National Issue."

Dr. Lewis Branscomb, vice-president and senior scientist at IBM, said in the unrehearsed panel session industry should pursue better technology even before possible uses are contemplated.

History proves, Branscomb said, that many benefits of technology are discovered after implementation and that many technological devices had unperceived uses in and of themselves as well as in components of other systems.

Dr. Brockely McMillan, vice-president for military systems at Bell Laboratories, upheld Branscomb's observation, citing the transistor and vacuum tube as specific examples.

In fact, these two devices not only had unperceived benefits; they were developed with no users in mind.

McMillan agreed technologists must make a choice before spending a decade of time (and financial investment) on progress, but he insisted it is the developers, aided by perceptive marketing experts, who must make those choices, not the potential customers.

More Communication Needed

Branscomb, on the other hand, called for shortening the lines of communications between user and provider, a "joint effort" to put user and developer in direct contact.

He cited user groups such as Share and Guide as fulfilling part of this concept and industries such as system integrators or software houses as also contributing.

If a user wants technology tailored to his own needs, he must be willing to take on new risks at added costs, Branscomb said. He cited the military procurement system as one area where the customer has proven willing to make these concessions.

Users, Branscomb continued, should also be willing to invest time and effort in educating the vendor in the user's business. This would be "terribly useful" in designing products and in enhancing productivity, he added.

This willingness is especially prevalent in the DP or information industry, he said, since "it is the nature of information technology" that the suppliers must be close to the users to facilitate the process of technology transfer.

Broad Education Helps

Prof. William F. Miller, vice-president and provost of Stanford University, cited the need to give students broad educations, as opposed to strength strictly in a technological area to help them in this transfer process.

If education is too specialized and, therefore, too narrow in scope, students lose the ability to deal with complexities.

Educators are in business "to develop capacities, the basic tools, logic" he noted, and not to "narrow students into a funnel."

There are areas of specialization in industry, however, which do facilitate the transfer of technology, he said, using architects and company design divisions as examples. Consultants also serve this purpose, noted McMillan.

Branscomb said these people are needed because the providers, the technology developers, have done a poor job of providing usable systems.

Part of the problem of the fast rate of technology transfer, which is common in the U.S., according to Branscomb, is the short development cycle of generations of computer equipment. A five-year cycle provides short time for feedback, he noted.

A possible answer is providing end users with "the raw technology" in hopes they can use it, he continued. The microprocessor and other OEM segments of the computer industry do this already, Branscomb said.

Industry must strive, he said, to "anticipate both the technology and user worlds of the future and be intelligent about it."

Branscomb also cautioned advocates of exporting technology to underdeveloped nations that might not know how to use it. "You can't give away wisdom," he said, adding only a "sophisticated user" will face a continued need and ability to use new technology.

Thus, the transfer of technology to underdeveloped societies often means the transfer of the expertise to use it, bringing in outside experts or systems implementors, he said.

Brockely McMillan

William F. Miller

As DP Education Debate Continues

University Seen Obligated First to Its Students

By Nancy French
Of the CW Staff

ANAHEIM, Calif. – The continuing fight over whether universities train computer scientists to do the kinds of tasks the industry requires went one more round at the National Computer Conference last week as four industry panelists took on four academicians.

Dr. Edward L. Glaser, chairman of the computer science department at Case Western Reserve University, said "when we were teaching things like virtual memory and the precursor to structured programming, employers were complaining that we never taught 'practical' things needed on the job such as autocoder and other such long-term skills.

"The key thing we must teach the student is to teach himself and give him knowledge that will be useful for at least 10 years after graduation," he said.

"Our obligation is to the student, not the employer," Glaser said. "It is the student who is paying for the education. The employer gets it for free.

"I think any computer science student should be able to use a computer to solve practical jobs. Engineering students should be able to solve engineering problems and business students should be able to solve business-related problems using the computer," he said.

Rather than continuing the adversary relationship between education and industry, a way to work for the student, the university and business must be found, he said.

Daniel Couger, computer science professor at the University of Colorado, set the problem into context.

"As each new system was introduced, we were told the system would be easier. But as technology improved, the training problem increased rather than decreased," he said.

Today's computer science graduate must design computer systems and select data bases, which are much more difficult tasks; in the meantime, university budgets are getting tighter as the faculty/student ratio worsens each year, he said.

Rather than fragmenting the industry still further with more emphasis on separating the "elite 5% who are craftsmen and artisans from the remaining 95% of tradesmen," Couger said a unified body can contribute more to the cause than elitism.

The junior colleges, he explained, have a chip on their shoulders because their courses are "more mundane" than those found in the universities.

Couger called for unity, and quoted the Apostle Paul in Corinthians 112, Verse 14: "One should not think of one part of the body as separate and distinct from the others. The body is a whole and when one part suffers so does the rest."

"We draw a distinction between education and training and concentrate on concepts and principles, and this leaves us open to criticism for lack of the practical," he said.

Industry training should cover special operating systems, he said. Critics say "we are not concentrating on tools and techniques of programming," Couger said.

Two Years or Four Years?

Moving to a discussion of two-year vs. four-year computer programs, he said while junior colleges attempt to prepare systems designers, they lack math and some of the physical sciences they need, thus limiting these students.

Despite improvements in technology, there's no reduction in the level of education needed to run such a system, Couger said.

And because there is a need for good people at all levels, the junior college plays an important roll in training skilled technicians. The junior college has three basic functions: vocational, continuing education and transfer courses, according to Thomas Cashman, associate professor of business data processing at Long Beach City College.

The junior colleges actually train students to become control clerks, data entry operators, computer operators and even computer programmers, Cashman said.

John Bentley, a doctoral candidate in computer science at the University of North Carolina, praised his two-year DP course at Long Beach.

"The type of DP skills taught in a two-year program are essential for many existing DP jobs," he said. "Knowing this type of material is as important to a computer scientist as knowing how to repair a TV is to a person who designs one," he said.

The four-year computer scientist doesn't even know machines, while the two-year DP graduate already knows how to do such things as set up files, he said.

While the computer scientist is still looking for the problem to be solved, the person coming out of the two-year DP program already knows what kinds of problems are useful to be solved, he said.

Expressing the industry view, Dennis Fletcher, a management consultant, said a survey of small business systems showed basic accounting was highly stressed by small business systems users, who indicated 75% of computer science grads needed more training in this area.

"Many of these people know how to write a program but not how to design a system," he said.

Another weakness in the computer science graduate is not knowing how to get along well with users.

"Students coming out of school don't know how to deal with this. It's a real shock when they come out of school and start having to depend on their basic communications skills," he said.

These problems bear directly on the fact that teachers are typically away from industry too long. Textbooks written by such absentee computer scientists give fairly good guidance for programming, but separate students from the real world.

Students need closer industry contact, Fletcher said, and schools need internship programs to give students a chance to work on real problems rather than hypothetical ones.

Businessmen should be allowed to be on college faculties and go back and forth from industry to education, he said.

Robert R. Brown, assistant director of computing services at Hughes Aircraft Co., said he was "not interested in vocational schools because typically they teach such antiquated subjects as DOS programming.

"I'm not interested in training blacksmiths any more," he said.

Portability, Reliability Seen as Ignored by Vendors

By Don Leavitt
Of the CW Staff

ANAHEIM, Calif. – Neither hardware vendors nor software houses are terribly interested in encouraging development of portable and reliable software. Only users are really interested in the subject, according to P.J. Brown, visiting professor at the University of Colorado.

Describing the tentative conclusions of an Anglo-French study of software portability, Brown told an NCC session moving software from one system to another in the U.S. costs something on the order of $3 billion/year.

The joint study, with a goal of seeing whether there really is a need and a market for software portability, considered the subject in the widest possible sense, Brown said, including both data and program transferability.

The range of definitions for the term "portability" astonished the study team, Brown said.

An assembly-level programmer told them "portability means emulation," but a Fortran user said "portability means running my Fortran program on any computer."

"Program portability isn't important; transferability of the operating system and software on that level is," another said, while one told the study group, "if the program is properly written, portability will come automatically."

Two Basic Approaches

There are two basic approaches to the problem of portability. Users can be "predictive" or "corrective," Brown said. The predictive user goes strongly for advance planning and this may double the cost of the first implementation. But there will be a good payback if the programs are later installed on three or more machines, he added.

Building new programs in terms of an abstract machine is perhaps the most accurate but most costly predictive technique. Settling on a subset of a common language, especially Fortran, is another way to attack the problem, but some say the "only common subset of Fortran is the Comment statement."

The corrective technique attacks the problem the most direct way the first time and then faces up to the next implementations when and if they are needed. Assembly language and "private" languages are often the tools of programmers with this approach, he said.

Converting programs from one system to another involves two parties: a donor and a receiver. If both are from the same organization, the process may be fairly simple, but if the receiver has to do all the changeover himself, the job is much tougher.

More Research Needed

Even with the preliminary study out of the way, Brown said, there are indications of more research being needed. Although the U.S. Navy has done some work on Cobol, more work on means of certifying compilers is required, he said.

Aids for enforcing user standards are needed. Current thinking tends to equate these user standards with prohibitions against language features that are unique to a given vendor's implementation, Brown noted, quipping that "maybe contractible languages would be better than the extensible languages so popular a few years ago."

Top-down methodology and a study of language features are other areas for further study, but so is finding a means of "escaping from Fortran and Cobol." This "escape" means finding a solution better than the old languages and a means of translating programs to and from both Fortran and Cobol, Brown said.

A better understanding of what is involved in emulation might help the portability of some systems, he said, but another area – generally neglected – also needs attention.

What are the legal aspects of portability? Is there any problem in moving a program or a whole software system from one mainframe to another? he asked, without offering any answers.

'Universe of Objectives' Contradictory

Good Program Language Design a Difficult Task

By Don Leavitt
Of the CW Staff

ANAHEIM, Calif. – Programming is now understood to be a rather difficult task which requires the simultaneous application of principles, skills and art. Certain programming languages and language features are particularly well suited for the use of systematic techniques, while others hinder such discipline, according to Anthony I. Wasserman of the University of California.

Leading an NCC session on "Issues in Programming Language Design," he noted "a significant number" of languages have been designed and implemented with "several" developed principally to promote proper programming practices. Features of existing languages have been analyzed to identify good points and weed out poor ones.

Preprocessors have been built, language changes implemented and design criteria advanced with attention focused on the need for a language to have a sound theoretical basis. Although the design goals of each of these developments vary considerably, a number of common objectives are apparent, he added.

First, the value of linear flow of control was recognized, especially for its value in program debugging and verification, and "powerful" control structures were proposed and added to several of the languages to promote such a flow, the professor noted.

Second, because traditional data structures are often too restrictive, the value of abstraction has been recognized as a way to develop a representation of information which is more closely related to the application being programmed than exists in any programming language with a fixed number of data types, he said.

Scope, Binding of Variables

The scope and binding of variables was studied as a technique which simplifies program verification and – perhaps more important – reduces the programming errors caused by unexpected side effects brought on by variables improperly "controlled," Wasserman added.

Another point that soon became clear to some language designers revolved around the idea the overall effect of a language had to be comprehensible. Programs written in the language have to be readable so they may in turn be maintainable, he explained.

But, despite the possibilities promised by "extensible languages," many designers worked to limit the size of the languages to make them easier to implement. This also made it possible for a programmer to more thoroughly understand the tool available to him, he said.

Finally, he went on, modular program structures were seen to make an "important contribution" to the production of large software systems, although there seemed to be some disagreement as to just what constituted good modular design.

Trade-Offs Among Features

Actually the "universe of design objectives" is somewhat self-contradictory, Wasserman said, and the designer has to consider the trade-offs among the various possible features, inevitably giving more emphasis to some objectives than to others.

Beyond that point, he said, there are a number of political and economic issues which affect the acceptance of any language. The primary factors appear to be support given the languages through implementation by major hardware and software vendors.

The ease by which programmers and programming management can be attracted away from their present language and trained in the new language obviously impacts the acceptance of a new offering.

Until the transition becomes extremely easy, and the payoff gained by the change far higher than it is with most currently available languages, "most programmers will be left to work with tools now recognized to be somewhat inadequate for the effective solution of programming problems," Wasserman said.

Most of the panelists echoed the chairman's pessimistic view of the time and effort needed to break programmers away from Fortran and Cobol, both of which were developed in the late '50s.

Role of Communication, Purpose of Programming Debated

By Don Leavitt
Of the CW Staff

ANAHEIM, Calif. – What really is the purpose of programming?

That was the basic question faced by an NCC first-day session that led into a discussion recognized, by one participant, as being "on the edge of both theology and philosophy."

Entitled "Programming as an Act of Communication," the free-wheeling session split down the middle on the question of what computers really do for people – or what people have to do to make computers do what they are "supposed to do."

Consultant Charles Seitz opened the discussion by noting that computers move information from place to place ("that's communication") and from time to time ("and that's the storage capability"). They also allow the moving "messages – and that includes both data and what we call programs – to interact with one another."

Since programs are nothing more than one set of messages developed to interact with another, "people don't think very clearly about them. It is in fact very hard to understand what the process set in motion by the program will do."

A similar comment, but totally different conclusion, was offered by Roger Brown, president of Copley Computers, Inc. and chairman of ACM '74.

"The vast majority of people don't understand what they're doing with programming," he said, "but the fact is, all programming is a form of simulation."

It's immaterial what is actually happening inside the computer itself, as long as the programmer can form a mental analogy of the mechanical process required to perform the logical steps specified in the program design. If the mental analogy is correct, the program will do what is expected and the data will be transformed or stored as expected. The process is therefore one of communication.

All that may be true, admitted Burroughs Corp. plant manager Robert Merrell, but it doesn't help much, since "communication is – according to some – the only human activity."

Most major problems, in programming or in other areas, are based on misunderstanding, he added.

Recognizing the closeness of his comments to theology and philosophy, Merrell asked the other panelists to see the purpose of designing systems is to help people in their daily work.

"Change occurs only after communication," he remarked before talking the session through his view of how the human mind works.

Emotions may be part of the human condition, but they have no part in the activities of the computer. "There is no such thing as 'automagic' and the program must be absolutely precise in what it does since the computer has no perception of what it is doing," Merrell said.

One reason people have trouble relating to the computer, he added, is that batch processing is "antihuman" in the way it works. Because users have to decide what can be automated – what can be done to help people – a computer's purpose cannot be to replace people. "That's got to be the worse kind of nonsense."

Terms such as "computer language" confuse the issue of how "human" the computers are. That term is "repugnant," he said, since it implies people should be able to read programs "and we really can't."

CW Photo by V. Farmer

Gee Dad, It's a Wurlitzer

Basic Timesharing juxtaposed this vintage Wurlitzer against its time-sharing system to point out that, today, 60 minutes of time-sharing can be cheaper than what one play of the 78 used to cost.

Editorials

Congratulations on NCC '75...

Well, NCC '75 is over and, as one of the biggest shows in the American Federation of Information Processing Societies' (Afips) history, it warmed the heart of any confirmed floorwalker. The show was like a shot-in-the-arm of pure enthusiasm.

Attendees were everywhere eagerly gobbling up information while talking turkey with dollar signs attached.

If the floor activity is any real indication of the strength and viability of our industry, the good old days of 1969 and thereabouts must certainly be coming around the corner.

But the industry is changing, as witnessed by the lack of mainframers and related plug-compatible peripherals in comparison with that golden year of 1969. Today the action is minicomputers, terminals, distributed processing and dedicated systems.

There were crowds and people in the way, but the show exuded confidence and viability in our industry. Our heartiest congratulations to Afips on one of its best NCCs.

And we hope this shot-in-the-arm will not be dissipated by the destructiveness of foggy economic policies from Washington. Let the good old days of rip-roaring growth come on again.

...While Looking Ahead to '76

Dr. Stan Winkler is program chairman for NCC '76. Now, the job of program chairman is probably the most thankless as well as the most difficult job of the entire conference. But Winkler, a senior scientist (Complex Systems) for IBM, has set a goal of making NCC '76 a banner conference.

To do this he needs help — and is not hesitant to ask for it. The program for NCC '76 will be welded together in the next six months and Winkler said he needs good ideas, good papers, good speakers and, most of all, grass roots feedback on what potential attendees of the show want for session topics.

Winkler is especially upset many of the best DP professionals are content to leave conference participation to a core of "regulars." He seeks new ideas, new faces. Let's not let him nor ourselves down. If you have any suggestions, ideas or comments, Winkler can be reached at IBM's System Development Division, 18100 Frederick Pike, Gaithersburg, Md. 20760. Telephone: (301) 840-7076.

We also suggest you send your ideas to *Computerworld* for use in the brainstorming column — "Letters to the Editor." Plenty of ideas and comments will breed good conclusions and, hopefully, a banner NCC '76.

At Last a Beginning

The trial of the U.S. Government's antitrust case against IBM has begun at last, to the relief of both the computer industry and the community of users.

For over six years both groups were left hanging with the thought that one day there might be such a trial, but with the more real expectation that the trial would never take place due to an out-of-court settlement.

All doubt has now been dispelled. The trial has started and the chances of an out-of-court settlement at this stage of the game are slim.

It will be a long trial, with observers expecting it to last over two years before a decision is rendered, and it will definitely change the face of the industry.

It is good the case has begun, for only a court of law can resolve the unanswered questions about the role or position of IBM in the computer industry.

'He's Mine!'

Letters to the Editor

IBM Still the Best at Present— But He May Change His Mind Later

Those responding to my letter concerning choice of hardware [CW, April 23] reacted predictably. Like many responses to *Computerworld* letters, the rebuttals attempted to be funny rather than meaningful.

Of course professional DPers owe it to their employers to keep abreast of the hardware and software markets and to make decisions based on their experience in the field. My comments were directed to the small businessman who attempts to install a system without hiring DP professionals.

This is a very rapidly growing population, as Data General, Hewlett-Packard, Digital Equipment Corp. and others have obviously noticed by introducing mini commercial-based systems with packaged software.

Any business large enough to hire DPers has a much greater choice, a larger budget and a greater opportunity to save by shopping. The first-time user has less money, less to save and, most important, less time to spend when converting.

IBM may indeed be facing the most rigorous competition ever right now and, in one or two years, my present view will probably change. Right now, however, if I was shopping for my first system, I would play the favorite. I would need all the hand-holding, all the advice and all the experience that right now IBM can give best.

Incidentally, my boss, who has a DEC PDP-8 *and* a Hewlett-Packard system in his lab at home, agrees with me that the Model 15 we have is still the safest bet in our marketplace. He has always instructed me to make decisions which, to the company as a whole, represent the least risk.

To those to whom this represents a flaw in good DP practice, I say search on for that $5,000 annual saving which might cost the company that much in one week should things go differently than planned. Approach your DP decisions with open minds and knowledge of the available choices, but make those decisions with a corporate budget, not a DP budget, in mind.

G.H. Barger

Paterson, N.J.

Knowing What Was Where When

Herb Grosch's column on "Technical Publication" [CW, April 30] identified only a part of the problem. The problem for the user is to get the information he needs to solve his immediate problem at the time that he has the problem — and not a month before or a month after.

I am sure many of the trade journals have published problem definitions or problem solutions to most of the problems encountered during normal DP operations. The user, however, has difficulty in finding when and where this information was published when he needs it.

One possible solution would be for *Computerworld*, *Datamation* and the like to produce a keyword index at regular intervals so that the search length could be reduced quite drastically (have you ever tried searching through a year's copies of CW to find an article which you're sure you've read at some time or another?).

This would only solve part of the problem, since quite a few indexes would have to be searched if one were uncertain of the publications in which the problem solution had appeared.

Another solution would be to store resumes of all important articles published in the major trade journals in a computer data base. Organizations could then subscribe either to a regular keyword index printout or to searches for specific topics as required.

Users with terminals could even dial up and perform a search directly when necessary. I believe this method has been implemented for articles published within the field of medicine, but the need is just as great within the field of computing.

The problem is not, therefore, that there are too many publications, but rather that it is too difficult to find the information needed from the journals that are published.

Arne Rohde

Denmark

System/32 Not the First

I found David E. Ferguson's comments very interesting in the article "System/32 Expected to Increase Independent Sales" [CW, April 16], but disagree with his statement that "the System/32 is the first machine to bring business DP to users with no computer training."

For the past two years Wang Laboratories has been marketing the 2200 system and has sold over 6,000 units, many to users with no previous DP experience. What makes the 2200 as easy to use as that proverbial copier is that its compiler and most operating systems are in a hard-wired microprocessor that is "loaded" in with flick of power switch.

The fact that the 2200 also uses Basic rather than RPG-II allows first-time users who wish to experiment with their own programming a better opportunity of succeeding.

I had to agree, however, with Ferguson when he said that once users begin to look around, they will realize something else may provide a better price/performance ratio.

Glen Watkins
Accounts Representative

Wang Laboratories, Inc.
Newport News, Va.

(Other letters and commentaries on Page 18.)

Who, What, Ware. . .

This is an ill-tempered continuation of my comments [CW, April 23] about the hopefully ill-fated entry of the Institute of Electrical and Electronic Engineers (IEEE) into the software area. Two letters to the editor [CW, May 7] welcome the incursion, one in a friendly but overly optimistic way, the other wrong-headedly.

Let me review the bidding for readers with only a casual interest. The IEEE is now publishing a *Transactions on Software Engineering*, a substantial quarterly, at a price of $4 a year to IEEE members, $24 to outsiders. Note the unusual ratio of subscriptions to member prices: clearly a buy-in. The *cost* assuming no advertising support, must be over $10 a year. And the Computer Society arm of the IEEE, which is a member of the American Federation of Information Processing Societies (Afips) along with the Association for Computing Machinery (ACM), is holding a software conference at very short notice, one month before the ACM Annual this fall.

Note also that the title of the journal and the conference is "Software Engineering," not "Engineering Software." Note that the editor, Raymond Yeh, and at least five *Transactions* directors are ACM types: computer science people, data base people. I left the IEEE two years ago, after 20 years of senior membership; at that time Yeh, Boehm, Cheatham, Codd, Knuth and Mills belonged to the ACM and not to the IEEE.

Jerry Ogdin, referred to generously in an earlier paragraph as wrong-headed, also is an ACMer and was not then in the IEEE. He refers in his letter to ACM's academic orientation, which is true, alas! He says the publish-or-perish crew will be kept out of the "much more worthwhile" IEEE journals. When the editor and his referees are computer science professors? Come *on* Jerry!

Charlie Casale, who has belonged to both outfits, writes that the contributors on the IEEE side will be practical, cost-effectiveness-conscious people: Westinghouse engineers rather than Los Alamos physicists. My prediction is that they will be the same people writing the same goop that pollutes the ACM periodicals; the practical people are either functionally illiterate, too busy to write or too cagey to give away their trade secrets.

Jerry accuses me of being in the seventh age of man ["As You Like It," Act II, Scene 7]. I claimed two years ago in this column to be in the fourth age:

". . . bearded like the pard,
Jealous in honor, sudden and quick in quarrel."

So I resent a sister society muscling in on ACM territory, and I resent ACM people who have been treated well by the association acting as Judas goats leading the $4 sheep to the rotating-machinery-and-switchgear slaughterhouse.

Herb Grosch

Unchecked Specifications Cause System 'Arrogance'

The Taylor Report
By
Alan Taylor, CDP

At a recent Data Processing Management Association (DPMA) meeting, the question came up as to whether enough attention was being paid to the input systems designers had to deal with – as opposed to the output they produced. It's a good question and one which can be seen in simple form in the case of World of Beauty Club invoices.

The World of Beauty Club is a Chicago outfit which offers periodic "kits" of beauty products. The introductory offer is a $12 kit for $1, and, when the kit arrives, along comes the invoice whether or not payment is due.

It is a nicely balanced invoice, from the point of view of appearance, with pleasant red and pink design in four separate shadings and a description of the product on the left balanced with the address position on the right (shown below).

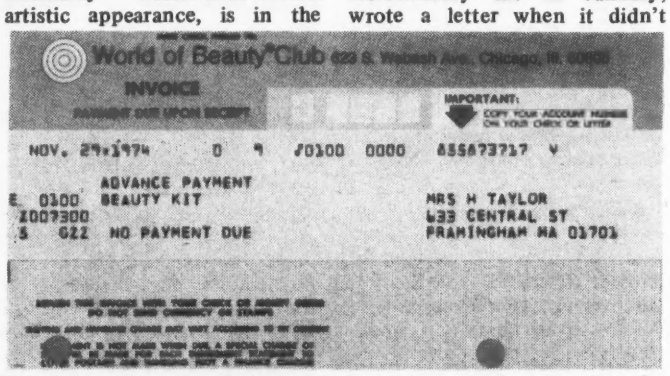
The only thing unusual about the invoice, other than its definitely better-than-normal artistic appearance, is in the terms printed at the bottom which permit "special charges" for what is termed "subsequent statements" – which appears to include any statement.

The address itself starts 22 positions in from the right-hand margin. On the surface, it could start earlier and so give more room for the individual lines, but that could destroy the balance of the item, make packing envelopes impractical, etc. In short, the design of the form could well be the input to the computer system designer, even though it is the output of the computer. (The tape layout is the current operational limitation – but where this came from 10 years or so ago is apparently not known.)

Normally, of course, the system works quite well. Figure 1 shows a perfectly acceptable address. The third line, using a city, state and zip configuration suggests trouble in the case of 12-character cities, because of the inevitable dedication of nine of the spaces to the state/zip fields, but, otherwise, all looks clean.

Enter Ms. B.B.

However, as the Action Line of the *Houston Post* reported on April 24, this address structure is certainly not clean. It appears a Ms. B.B. purchased an introductory kit in January, wrote a letter when it didn't arrive and then, when that got no response, wrote the the *Post*'s Action line. She wanted a response.



This balanced invoice design, with the address positioned well to the right hand side of the form, could have been a user requirement and often works well.

And she got one. Ms. B.B. had too long an address. She was expected to make her address conform to the limitations of the World of Beauty Club computers before her order – which she had actually paid for – would be sent out to her by the club owners.

The reason given for the requirement was that the club computers "limit an address to three lines with a maximum of 20 characters per line." Bob Thomas, who is in charge of the club's DP operations tells me the three-line limitation is a 10-year-old system design, one which could have had many reasons, including user requirements.

Which brings up the question as to whether a user requirement should be accepted by a system designer without ensuring it is realistic. So let's look at them line by line.

Three 20-Character Lines

A 22-character limitation for the last line is realistic, because the Post Office, in handling of bags, does limit matters to a 13-character town, with a reduced (three character) zip.

Twenty character lst lines – names also may be acceptable. They still can have problems with suffixes like '3rd' and at least one initial taking seven spaces. I don't like such a limitation, but I doubt if it would interfere with delivery of a package to a single individual.

Apartment Numbers

But a 20-character second line to handle all the information between the name and the zip code town is blatantly unreliable and is asking for problems – such as Ms. B.B. found existed. Apartment addresses, similarly named roads and cross streets are only a few of the complications.

"Care-of" addresses also use second-line space. There may be no accepted standard – but the resulting impression of arrogance that appears here is certainly invited by the system designer's acceptance of such a restriction.

Professionally, therefore, the question is, "Should user specifications be checked for potential problem areas, documented and, if necessary, rejected?"

The answer to this question, which is illustrated by the address limitations of the World of Beauty Club, is of importance to anyone who wants to understand how to stop computers from being used as scapegoats.

Currently, I don't think that it is clear at all as to what a systems analyst should do, when confronted with input, including a user requirement which includes such a limitation and, as usual, I would like to hear from you. A questionnaire is included for your opinions, but letters on the subject are most welcome.

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(1) When a user specification contains the roots of continuing occasional trouble, should a system designer (check all applicable boxes):
- **( ) Ignore it.**
- **( ) Confirm the user wish, and then ignore it.**
- **( ) Include a definition of the trouble in his documentation.**
- **( ) Adjust the requirement to minimize the trouble?**
- **( ) Other. (Please explain.)** _____

_____

(2) In your experience, is a 3 by 20 address layout a potential root of continuing occasional trouble.
( ) Yes ( ) No
Comment _____

_____

(3) What other items have you known which are potential causes of trouble that are included in user specifications?

_____

_____

_____

_____

(4) Have you any suggestions as to how computers and system designers can avoid being made scapegoats for other's thoughtlessness? _____

_____

_____

_____

Name _____

Position _____

Address _____

After completion, please return to Alan Taylor, c/o *Computerworld*, 797 Washington St., Newton, Mass. 02160.

Because There's No Clear-Cut Definition

Seminar Can End Structured Programming Confusion

By Gopal K. Kapur
Special to Computerworld

Structured programming has been hailed by some as a great revolution – but there are others who dismiss it as nothing more than warmed-over modular programming.

Why is there so much disagreement over its value? And just what is structured programming anyway?

Is it writing programs without any GOTO statements? Is it programming many small modules with single entry and single exit points? Writing nested IF statements with proper indentations?

Or, perhaps, using the basic coding structures: simple sequence, IF-THEN-ELSE, DO-WHILE, DO-UNTIL and the case structure?

People don't seem to have a clear-cut definition of this "new" programming method. Some writers classify it as an art form, while others proclaim it to be a scientific discipline that can be taught in the classroom.

During the last two years, the term "structured programming" has become extremely popular in DP circles. At times its use approaches that of any other DP buzz word.

It is a surprise to me, in fact, that some enterprising group has not announced a simple conversion routine that will take any old hodgepodge code and convert it, in a single pass, to a beautifully structured program (whatever that is).

Venture anywhere, and you will find someone talking about this new programming approach. Some may say they dislike the very word because they have come to believe that structured programming strictly prohibits GOTO statements and calls for multiple levels of nested IF statements.

Others have come to believe implementation of structured programming requires them to fall into teams, find lead and backup programmers, assign a librarian and mobilize the necessary administrative procedures to support this "revolutionary" method of program development.

It is rather interesting to note the amount of discussion and controversy generated by the GOTO statement. It is not uncommon to hear a programming manager claim in ecstasy that he has been having heated discussions on the subject of GOTO statements with his programmers over the last four months (the love of trivia is not restricted to old-time movie fans).

These people usually cite Djykstra's and Knuth's works to support their heated remarks. I wonder what they will say when they come across Knuth's recent research publication, entitled *Structured Programming With GOTO Statements.*

Design Phase

It is a well-accepted fact that the majority of application programmers produce software that is a jumble of poorly written code. Programmers devote minimum time to analyzing the problem, understanding its scope and *designing* a solution. Usually a programmer proceeds to code the program soon after receiving the specifications.

This leads to the think-as-you-go method of developing the program. Coupled with nonexistent coding standards and guidelines, it results in programs that have absolutely no structure.

In short, what is lacking in the conventional program development cycle is the design phase.

The only definitive work that addressed itself to design concepts and techniques for breaking a problem statement into strong individual structures (modules) was the paper "Structured Design," published in the *IBM System Journal* (No. 2, 1974).

This paper discussed structured design, structure interface, structure strength evaluation criteria, design techniques and design guidelines. It tried to quantify the criteria for breaking a problem into individual structures and evaluate the strength of these structures (individually and together).

This is the only paper that has, so far, discussed the program design process without tying it to coding procedures. How different this is from many other papers published recently, which, by the second paragraph, plunge full-force into a detailed discussion of coding techniques and extol the miracle-like properties of the coding constructs.

Most of these papers seem to tell the reader the coding constructs will emancipate the programmer from poorly designed programs. But what good are these coding methods if the program design is nonexistent or poor?

In fact, I have actually come across a number of programmers who believe that structured programming means just implementing the five coding constructs in their programs.

Understanding Needed

Under these circumstances, it is important programming managers and those responsible for DP training develop a good understanding of this new program development method and closely oversee any efforts to train their analysts and programmers.

During 1974 I taught graduate-level courses in structured programming at the San Jose and Sacramento campuses of the California State University. There were some rough spots during the semester, but most of the students and I survived the ordeal.

As a result, we have a suggested outline for teaching structured design and structured programming courses and seminars. If taught as a short seminar, there should be approximately 40 hours of classroom time with 20 hours of out-of-class reading and work assignments.

Kapur, president of Kapur and Associates, will share his proposed seminar outline and list of reference materials with interested readers who write to him at P.O. Box 81, Pleasanton, Calif. 94566.

Reader Commentary

Letters to the Editor

Properly Titled

Jack Edmonston was properly titled a "dilettante economist" when he attempted to step outside the sales arena and enter the discipline of economics [CW, April 23].

Specifically, Edmonston's economic naivete was reflected in his early comments: " . . . there is no underlying economic theory which is accepted by most economists."

Unfortunately, Edmonston was unaware that many theories are universally accepted by economists. Economists accept the theory of "want."

Want is basic to economics and Adam Smith clearly wrote that want plays an essential role in the consumption process. Smith and the entire body of economists who have followed him agree want is the sole end purpose of all production. Clearly, without want, there would be no basis for choice, no grounds for decision, no purpose for consumption.

From "want," "scarcity," the central fully subscribed-to and accepted theory of economics, evolved. It would be difficult to discover any true economist, let alone anyone completing a one-year introductory course in economics, who would not accept the underlying theory of scarcity.

"Scarcity," of course, gives rise to the act of "choice" which implies, by definition, "alternatives."

Edmonston should pick up an elementary college text on economics since he needs to understand economic fundamentals before attempting to tackle intermediate or advanced economic theory and applications.

Walter C. Bieda
Columbia, Md.

License the Right One

In the Taylor Report of April 30, Alan Taylor gave the example of a computer printout he received that "was alleged to have been destroyed in Shawmut's market analysis department" as "evidence DP may need portions of the licensing bill."

In support, I would like to relate that my postman got his hands crossed and delivered my next-door neighbor's gas bill to me. Shouldn't we strongly consider the licensing of gas meter-readers?

Seriously, if Taylor wants to cite improper distribution of computer-generated material as justification for licensing, he should be attempting to license those who receive or distribute that material, not the ones who produce it.

David T. O'Neal
Columbus, Ohio

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Random Notes

'Autotab' Update Extends Former Matrix Size Limits

PHOENIX – IBM 360/370 users operating under either OS or OS/VS are said to get more help than ever in producing formatted financial reports, including analysis of input data, with an enhanced version of the Autotab package from Capex Corp.

Autotab II works in batch or interactive environments, the company noted.

The major advance over the original Autotab lies in the size of the matrix Autotab II can handle. The old limit of 250 rows and 250 columns has been replaced by a maximum of 1,500 rows and columns combined in any proportion the user requires, Capex said.

Fees for Autotab II are $9,000 (one-time) or $330/mo under an annual lease, the company said from 2613 N. Third St., 85004.

Micro Gains Real-Time Support

MINNEAPOLIS – The RTX12 operating system introduced by Fabritek, Inc. for its MP12 microcomputer has been described by the company as the first real-time operating system for any microprocessor or microcomputer currently on the market.

The software is designed to support dedicated real-time applications. It includes facilities for multitask scheduling by a system clock, by external events or by operator command.

Functional task support, I/O processing and interactive operator control – including an ability to vary the priority of any task in real-time to meet changing system performance demands – are all part of the package, Fabri-Tek said.

The one-time charge for the RTX-12 package, including system generation program, executive routine and modules to link to all standard interfaces, is $500.

Fabri-Tek is at 5901 S. County Road 18, 55436.

SBC Extends Call/370 Network

GREENWICH, Conn. – The Service Bureau Co. (SBC) has added seven foreign and eight domestic service points to its Call/370 time-sharing network.

This expansion extends SBC's international network to Calgary, Canada, and Zurich, Switzerland, immediately and Dusseldorf, Hamburg, Munich and Stuttgart, Germany, in addition to Vienna, Austria, by June 1.

U.S. service point additions are Columbia, S.C., Des Moines, Iowa; Fort Worth, Texas; Hampton and Norfolk, Va.; South Bend, Ind.; Wichita, Kan.; and Winston-Salem, N.C.

Books on Debugging Vary In Value for Programmers

By James Douglas
Special to Computerworld

Program debugging is seldom covered in books, so it is welcome to see three books now available on the subject. It is ironical that the subject is discussed so little, since it consumes so much of every programmer's time.

One sage estimated that a program time schedule should be about as follows: planning, 10%; coding, 10%; debugging, 60%; and testing, 20%.

Now some may say the above is not correct since "they" never spend that much time debugging, but how often has your program been 90% debugged for two or three weeks?

The three books are quite a bit different, ranging from the grand sweeping view to the line-by-line error checking level.

– – –

Debugging Techniques in Large Systems, Randall Rustin, ed.; Prentice-Hall, Inc., Englewood Cliffs, N.J.; $10.95.

This book is a collection of papers from a symposium on debugging. Like any collection, it has both advantages and disadvantages common to anthologies.

It covers a wide degree of topics but basically tends toward the theoretical side of debugging. The first chapter contains a very good overview of bugs with many interesting observations.

Other topics covered include top-down programming, interactive debugging, debugging under simulation and discipline software testing.

– – –

Program Debugging, A.R. Brown and W.A. Sampson; American Elseview Co., New York, N.Y.

The book, which also covers a wide variety of debugging topics, is better suited for the active programmer than the first book. Some of the topics covered do not really involve debugging and one suspects the authors were trying to fill out the book.

Many work methods and specific techniques are listed to minimize debugging time. Type of errors, such as syntax errors and logic errors, are listed.

The authors list types of debugging aids available but make no recommendation on particular products. The book is well worth reading and should be in a company's programming library.

– – –

Program Style, Design, Efficiency, Debugging and Testing, D. Van Tassel; Prentice-Hall, Inc., Englewood Cliffs, N.J.; $12.95.

Even though the book covers other subjects too, the debugging and testing sections occupy a major part of the book.

This book gives many debugging hints for the programmer. Suggestions are provided on how to avoid bugs and how to locate bugs after it becomes obvious the program is buggy.

The author strongly suggests using debugging compilers and indicates which are his favorites for Cobol, Fortran and PL/I. Compiler options are discussed in regard to their value when debugging, and actual program bugs are used to illustrate the author's suggestions.

Douglas is an independent programming consultant in Sausalito, Calif.

Aid for Auditors

OAK BROOK, Ill. – A free set of applications tailor-made for the auditing industry is designed to run with Panvalet and Easytrieve, two utility software systems from Pansophic Systems.

The program, Easy Audit, is said to give the auditor the tools he needs to do a thorough audit by extracting his own data from the computer in whatever format he desires and to allow all auditors, even those with limited DP experience, to do an effective job.

Specific Easytrieve applications in the Easy Audit volume show aged analysis reports, stratification analysis reports and region accounts analyses.

Easytrieve job accounting applications utilized in auditing the computer itself are available as are routines that utilize SMF data or give DOS-Grasp or DOS/VS reports. A random number generator has been built into the system to aid auditors.

With Panvalet, the load module auditor shows the originating source for all load modules; Panvalet historical delete files store all deleted data sets; an archive file keeps all versions of production programs; and the Panvalet transaction file keeps track of all changes made to the library.

The systems "work well together" when, for example, an auditor wants to find out how many changes have been made to a payroll program, the firm said. All that has to be done is to use Easytrieve against the transaction file to get the desired information.

File sampling capabilities plug in to get results without reviewing all the records.

The firm is at 1301 W. 22nd St., 60521.

User Surveys Oft Neglected in Package Selection

By Nancy French
Of the CW Staff

SAN FRANCISCO – The task DP departments neglect most frequently in evaluating applications packages is a survey to determine what their users' precise management information requirements are.

"They forget the DP portion of an application is only part of the system," Ralph Sackman of Levi Strauss and Co. told Computer Caravan Forum participants here last week.

"More frequently than not, we ask ourselves, 'Shall we develop our own system in-house or buy a package?' Then, for a lot of logical reasons, the decision is made to buy a package," he said.

Somewhere along the way inputs and data elements are bypassed and the package gets substituted for a complete system and, "when the system isn't as effective as it should have been, people blame the package," he pointed out.

The user survey, according to Sackman, should clearly establish the frequency and timing of user reports. The survey should also include input and exceptions for calculations, he added.

The DP department's limitations should be considered next, including hardware configuration, memory capacity and operating system. In addition, the standards under which the shop is operating, along with the company's future plans, must be taken into consideration.

Modification Considerations

Next, DP personnel should consider those modifications the package would need before it could work for them.

"In this case, look at the complexity of the application and the capabilities of the DP staff members. If the in-house staff can't handle it, could an outside contractor be hired?" he asked.

Above all, "sell it to the staff by getting them involved early in the project. This will solve any reluctance to put it in," he said.

When a DP shop decides the package will do what it wants it to do, negotiations are the next phase.

"If negotiations are successful, implementation is partly complete since negotiations establish who does what and when," Sackman explained.

"Make sure your specifications are an addendum to the contract," he advised. "This will make your bargaining position a lot better and can be a condition for price reduction."

Finally, the company attorney should review the contract, he said.

The buyer can be reasonably sure "the package will fly if you, the user, satisfy the DP department's limitations and assure the system is cost-effective," Sackman said.

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'Ramis' Option Lets T/S Firms Compute Charges for Users' Time

PRINCETON, N.J. – A Usage Accounting Option has been added to the Ramis information management reporting software system of Mathematica, Inc.

The option is said to be especially useful when Ramis is used under IBM's Time-Sharing Option (TSO) or VM operating systems in which users operate from terminals because it enables the management of the DP center to automatically charge the software package user for his time, the firm said.

Charges can be computed on the basis of time (task or elapsed time), volume of activity (number of transactions processed or lines written), resources required for an activity (core size) or of any combination of these parameters.

Data collected and logged by the Usage Accounting Option include date of run, start and end time, job name, account code, number of records retrieved, CPU task time, transaction processed, records added or changed and core used.

The basic Ramis system leases for $840/mo or can be licensed for $28,000 plus an annual maintenance fee. The Usage Accounting Option leases for $75/mo or can be licensed for $2,500.

Mathematica can be reached through P.O. Box 2392, 08540.

Interface, Numbering Routines Mark Release 2 of 'CBLshort'

LYONS, Ill. – Release 2 of CBLshort – a Cobol precompiler – in addition to many program changes to improve operating speed, now has two new features according to its developer, General Electronics.

An interface routine allows input and/or output for any of the source library systems available such as Panvalet, Librarian and others and it is now possible to supply input to CBLshort, reformat and restore to the library in only one pass.

A paragraph numbering routine also adds a sequence number to all paragraph names. All references to the old names are changed. If a sequence number already exists, only the number is changed. This feature is controlled at execution time and may be turned off if desired, the firm said.

CBL Short Release 2 is supplied in Ansi Cobol and will support all levels of Cobol. Since the program works on key words, it can be used on other than IBM versions of Cobol, the firm said.

Priced at $300, including source code, the package is available through P.O. Box 79, 60534.

'Copes' Collects Project Data

ST. LOUIS, Mo. – A system for building budgets and controlling actual costs of large projects is available from McDonnell Douglas Automation Co. either as a remote computing network service or as a licensed package, the firm said.

Known as Cost Planning and Evaluation System (Copes), the system collects data on a project, converts the data into common cost terms and summarizes the information for management through many different kinds of reports.

Copes is said to accept any kind of cost data, including budgets, estimates, commitments, forecasts and actual costs. These cost items are further identified in the system by labor type, material, equipment and indirect and subcontracted costs.

The package allows the cost types to be time phased through a built-in calendar, thereby spreading budgets or estimates over the anticipated expenditure period for comparison against actual costs as they are incurred.

The price of a paid-up license is $24,000. Maintenance can be obtained for an additional $100 a month from the firm which can be reached through Box 516, 63166.

Payment Plans Lengthened For MRI 'System 2000'

AUSTIN, Texas – Several changes have been made to payment plans for acquisition of MRI Systems Corp.'s data management System 2000.

Customers can now acquire a paid-up lease for System 2000 with 12-, 18-, 24- or 36-month installment payment plans. The 12- and 18-month plans will show a slight decrease in cost over similar plans in the past, with the 24- and 36-month plans being instituted for the first time, MRI said.

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Forms-Oriented Software Fits Incoterm SPD 20/20 Terminals

NATICK, Mass. – Incoterm Corp. now offers Incoform, a forms-oriented source data entry software package for use with its diskette-based SPD 20/20 multistation intelligent terminal system.

The Incoform system is said to provide users with a comprehensive set of applications-oriented, general-purpose software modules for custom forms design and data entry control.

Control of forms generation and data entry may be by supervisory personnel at the source of the data, permitting local management of data recording, formats and edit/validation needs or by central office management allowing standardization of forms and data entry procedures, the firm said.

Remote job entry functions can be accomplished at the remote site, eliminating the costly and time-consuming process of hand carrying or mailing punched card decks to the central site for processing and the wait required for any replies, the firm said.

Multifunction software also allows the system to be operated in inquiry/response mode concurrently with data entry operation.

A basic Incoform system for data entry has an SPD 20/20 terminal processing unit, 1,920-character CRTs with data entry keyboards and a dual diskette.

The basic system may be upgraded to include simultaneous remote-job-entry operation by adding a card reader, line printers and the desired remote batch terminal emulator.

Each diskette is capable of storing approximately 250,000 bytes of data. The diskette is used for both on-line storage and retrieval of forms and data and may be polled at any time for transmission of data to the central site.

The firm is at 6 Strathmore Road, 01760.

Time-Sharing System From APL Analyzes Periodic Cost Data

TRENTON, N.J. – APL Services, Inc. has added Action/Data to its Action/APL.SV time-sharing system public library.

Action/Data is a system for recording and analyzing periodic cost and/or revenue information pertinent to a fleet of vehicles or any operating equipment from power tools to cranes. Cost and descriptive categories for the creation of data base information are identified with data words such as DATE (date of purchase), ELEC (electrical maintenance), HOURS (hours of use), etc.

Input/output action words are used together with the data words (ADD, CHANGE, LIST, etc.), giving the user the advantage of an English-oriented system, the firm said.

Major Payoff

Perhaps the major payoff from using Action/Data for fleet cost control comes from judicious use of the "STUDY" function, the firm said. With it, the user can review the differences in cost and/or cost per hour (or use).

Each application of Action/Data for fleet cost control will be tailored to the user's needs. For this reason, there will be an initial charge of $500 plus expenses.

The service bureau is at 684 Whitehead Road, 08638.

Computer Services Offering 'FDOS III'

SAN LUIS OBISPO, Calif. – Computer Services has announced a floppy disk operating system, FDOS III. This system uses a Computer Automation LSI-2 mini and Minicomputer Technology's interface with one or two floppy disk drives.

FDOS III includes a file manager, text editor, assembler, linkage editor and a complete utility package. Other features include chaining and linking of programs, batch mode and job processing.

The minimum hardware configuration consists of a mini with 8K memory, one floppy disk drive and a standard ASR Teletype. From separate vendors, this configuration can be acquired for under $7,000.

FDOS III is priced at $1,000 plus $200/year after the first year for maintenance and program updates. The company is at 793 Higuera St., 93401.

Cybernet Aids Business Planning

MINNEAPOLIS – A time-sharing service designed for business planning and analysis is now available on Control Data Corp.'s Cybernet networks in the U.S., Canada and Europe.

The service, called Interactive Financial Modeling System (IFMS), combines English-language equations to define problems for subsequent analysis with a special "what-if" capability. In addition, uncertain future situations can be described using built-in probabalistic functions.

Non-Specialist Features

These features, according to the company, allow the businessman who is not a programmer to build a current financial model of his company, put in all the variables and, in a conversational mode, explore how changes may affect his company or what would happen if his company actually took certain actions.

Thus the business planner could, for example, explore how combinations of price fluctuations, interest rate changes, capital expenditures and other factors would correlate under any set of future circumstances.

IFMS has been designed for corporate planners responsible for profit and loss analysis, pricing strategies, inventory planning and cost reduction programs.

The time-sharing features also permit rapid model building, analysis and quick response to questions for department planners involved in sales forecasting, budgeting, manpower planning and cost-estimating, the company said.

Charges for use of the system are based on the amount of Cybernet resources employed. CDC can be reached through HQSO5E, P.O. Box O, 55440.

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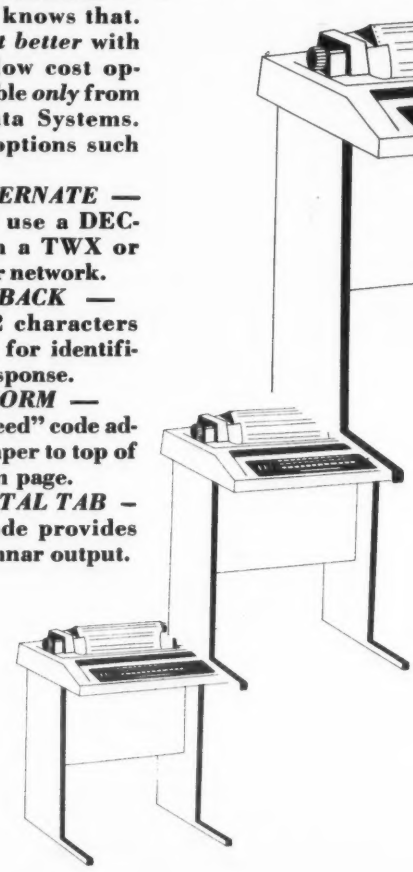

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The V-75 widens the competitive gap even further with the Writable Control Store package. New firmware modules include byte and stack manipulation and accelerated FORTRAN functions.

The new, fast FORTRAN included in the V-75 package is comparable to large machine compilers. With double precision integer data, compiler overlays, seven dimensional arrays, and direct access I/O.

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COMMUNICATIONS

AT&T Forms Group to Evaluate Non-Bell Gear

By Ronald A. Frank
Of the CW Staff

NEW YORK – AT&T has established a product evaluation group that can recommend the use of non-Bell data communications and other equipment to Bell System companies.

Called the Purchased Products Division (PPD), the group is specifically charged with evaluating products of "general trade suppliers," which is AT&T's term for non-Bell vendors.

Although the PPD is looking at all types of telecommunications products, according to Jere Cave, AT&T assistant vice-president who heads the division, data communications are very much a part of the process. The division was set up to provide a centralized interface between the Bell phone companies and the general trade suppliers so that equipment can be offered on a uniform basis to customers.

"We are looking for quality products, reasonably priced, with good service features regardless of the source of manufacture," Cave said. Before any recommendations can be made, a product has to be evaluated according to a rigid set of criteria.

In the case of data sets, end-to-end compatibility with comparable Bell System devices would be important. Other points to be evaluated include the ability to absorb harmful voltage surges and reliability or mean time between failures.

An evaluation report has already been issued on about eight low-speed data sets and several proposals have also been made by non-Bell suppliers of high-speed data sets, Cave said. The higher speed data sets will be evaluated soon, he added.

The evaluation of the low-speed non-Bell data sets included units from several suppliers. These were tested for more than a year on their ability to meet the established criteria. The "hands-on" tests included the ability to withstand high voltages, crosstalk and similar technical parameters.

Although a product evaluation report on four vendors supplying Bell 103A-type data sets has been in the works for some time, it has not been seen outside the Bell System. One vendor whose set was evaluated said many promises have been made about a positive report, which presumably would pave the way for the Bell companies to tariff the data sets.

Another evaluation reportedly was issued on non-Bell Data Access Arrangements, but the unit or units being evaluated were rejected for technical reasons.

Since Cave's group only recommends, there is no obligation on the part of the Bell System companies to tariff approved items. But even within this constraint, Cave said it was fair to assume non-Bell data communications equipment would soon be available from local Bell companies.

The announcement by Pacific Telephone and Telegraph that it has tariffed the General Electric (GE) Terminet 300 (see related story) was not a direct outgrowth of work done by his group, Cave said. Since the introduction, however, PPD has been working with GE on the possibility of the terminal being offered by other Bell System companies.

PT&T Jumps the Gun

SAN FRANCISCO – Pacific Telephone and Telegraph (PT&T) has tariffed one of the first non-Bell data terminals to be offered to Bell System customers.

The telephone company has filed an intrastate tariff for the General Electric Terminet 300 teleprinter and first installations of the unit were made in April, a PT&T source said.

The telephone company has designated the teleprinter the PAC 300 and is offering receive-only and keyboard send/receive versions with both magnetic tape and paper tape options.

Prices for the 30 char./sec teleprinter range from $115/mo to $160/mo with installation charges ranging from $180 to $210 depending on features. General Electric is training PT&T field personnel in the procedures required to maintain the terminals.

Coaxial Cable Modem Has 500 kBit Speed

BETHEL, Conn. – Computrol Corp.'s Model CM-500K modem is said to be suited for transmitting asynchronous digital data over a single conductor coaxial cable.

The modem allows a data transmission of any bit rate up to 500 kbits over distances of 40,000 feet on coaxial cable without repeaters, the company said.

The modems are coupled to the cable to permit connection of hundreds of units without disturbing the cable characteristics, the company added. Applications include high-speed data communications between computers and peripherals and remote monitoring and control applications.

The modem uses FM carrier transmission to provide immunity to electrical noise in difficult environmental applications. The modem configuration also permits grounding of the coaxial cable's outer conductor for safe operation of all devices connected to the transmission link, Computrol said.

The CM-500K sells for $575. Delivery is 30 days from the firm at Berkshire Industrial Park, 06801.

By Using Self-Service Terminals

Credit Unions Open Around the Clock With EFTS

DAYTON, Ohio – An Air Force sergeant walked up to a self-service teller terminal at a site here and made a $50 cash withdrawal from his credit union account. A routine transaction?

Not really. The sergeant is on temporary duty at nearby Wright-Patterson Air Force Base, but he is also a member of Bolling Federal Credit Union – several hundreds of miles away in Washington, D.C.

Similarly, a Washington, D.C., employee of a DP supplier made an automobile loan payment through a financial terminal at Bolling Air Force Base there. His credit union is based in Dayton.

What the two transactions have in common is that both were made through an electronic funds transfer system (EFTS) in which NCR 770 self-service financial terminals in and around Washington and Dayton are on-line 24 hours a day to a computer at Electronic Record Keeping Company, Inc. (Erco), a Dayton DP center.

To the Bolling Federal Credit Union, which is open to civilian and military personnel connected to the U.S. Air Force Headquarters Command at Bolling Air Force Base, the system means expanded service. O. Ray Stephens, treasurer of the Bolling credit union, also sees it as the salvation of small credit unions and "the key to survival of the credit union industry and its ability to compete with banks and savings and loans."

Locally, members can transact business (with the exception of taking out initial loans) day or night through automated tellers just outside the base credit union office. As the need arises, other terminals can be installed wherever there may be a concentration of members in the Washington area.

Installation of the 24-hour tellers was practically an adjunct of an existing system. Bolling Federal Credit Union already was on line to the Erco mainframe with NCR 270 financial terminals. The automated tellers extended service around the clock and expanded potential coverage to nationwide proportions without loss of controls.

Secret Code Numbers

Said to be one of the larger credit unions, Bolling Federal has assets of more than $15.6 million. Membership totals about 13,700, of which some 7,700 reside in the Washington metropolitan area. The other 6,000 are scattered throughout the world.

Identification cards for use in activating the automated teller were sent to the 7,700 credit union members in the Washington area. Each card was imprinted and encoded with the member's account number.

One week after the "Rite on Line" cards were mailed, each member received a secret code number which, when entered into the numerical keyboard of the automated teller and verified by the computer as belonging to the card holder, authorizes a transaction.

Operation is a step-through process in which an instructional display guides the member through the transaction sequence. By following instructions, a member can make an inquiry as to a loan or savings account balance, a deposit, a withdrawal, a transfer or a payment.

The Bolling credit union also has the system programmed to make a loan advance of up to $200 per day and to accept utility payments.

Besides capturing the transaction and immediately updating the member's records, the CPU responds by having the automated teller print a detailed receipt. If the transaction is a withdrawal, cash is dispensed with the receipt. All transactions are posted to a journal used by the credit union for control purposes.

Built-in controls prevent completion of any transaction without insertion of the plastic identification card and keyboard entry of the six-digit secret code.

As other credit unions are brought into the system, a Bolling member will be able to conduct business through their automated teller terminals, and vice versa. Terminals will be programmed to identify and locate the credit unions through the card numbers. Similarly, a member or a credit union can be locked out of the system.

In the past, a member outside the immediate area made withdrawals, deposits and payments through the mail. On withdrawals, this meant a turnaround of at least a week.

Payments and deposits were made well in advance to conform with late-charge and dividend deadlines. Now, a member can get the same service from an automated teller as he does at the base office.

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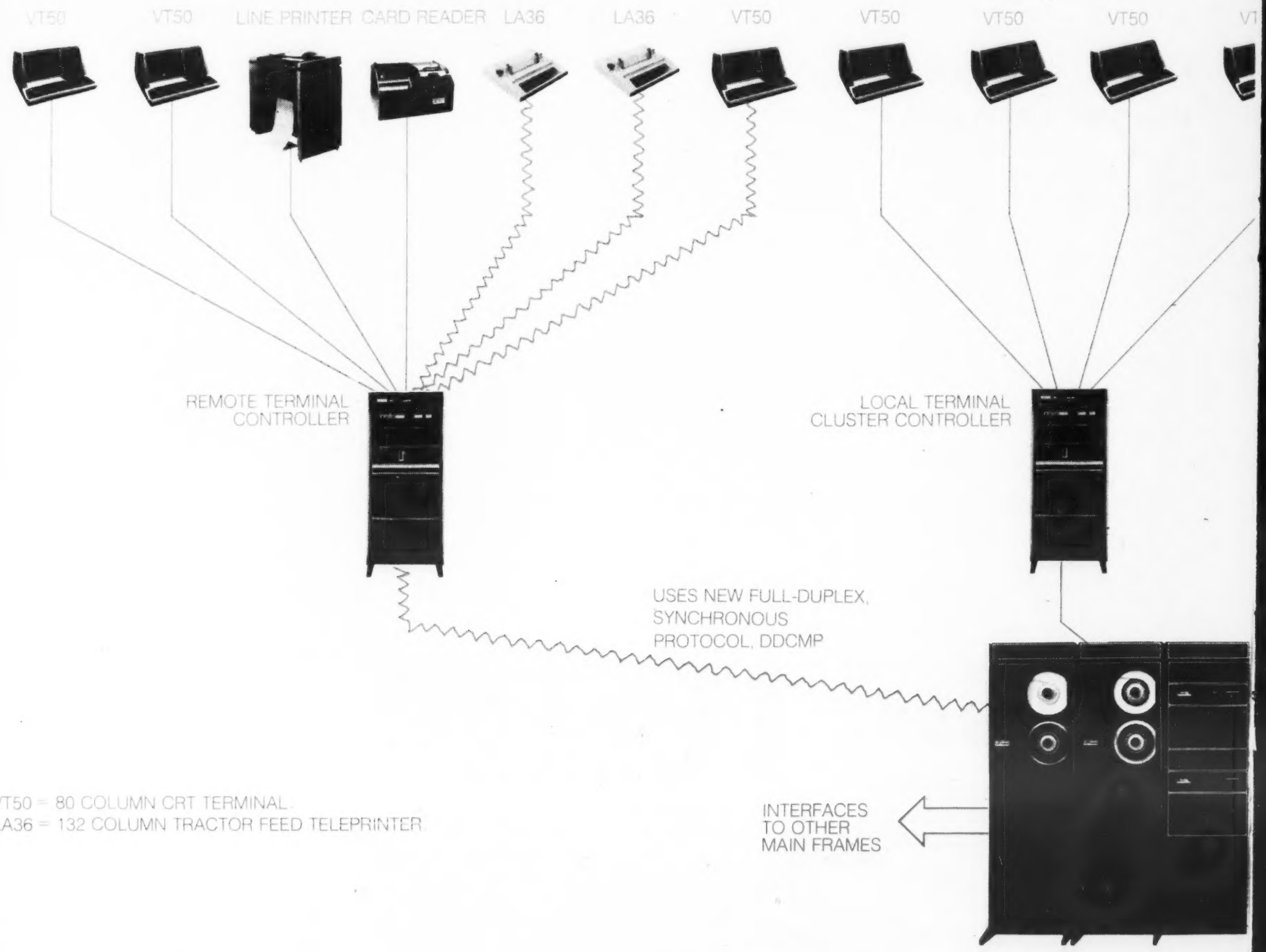

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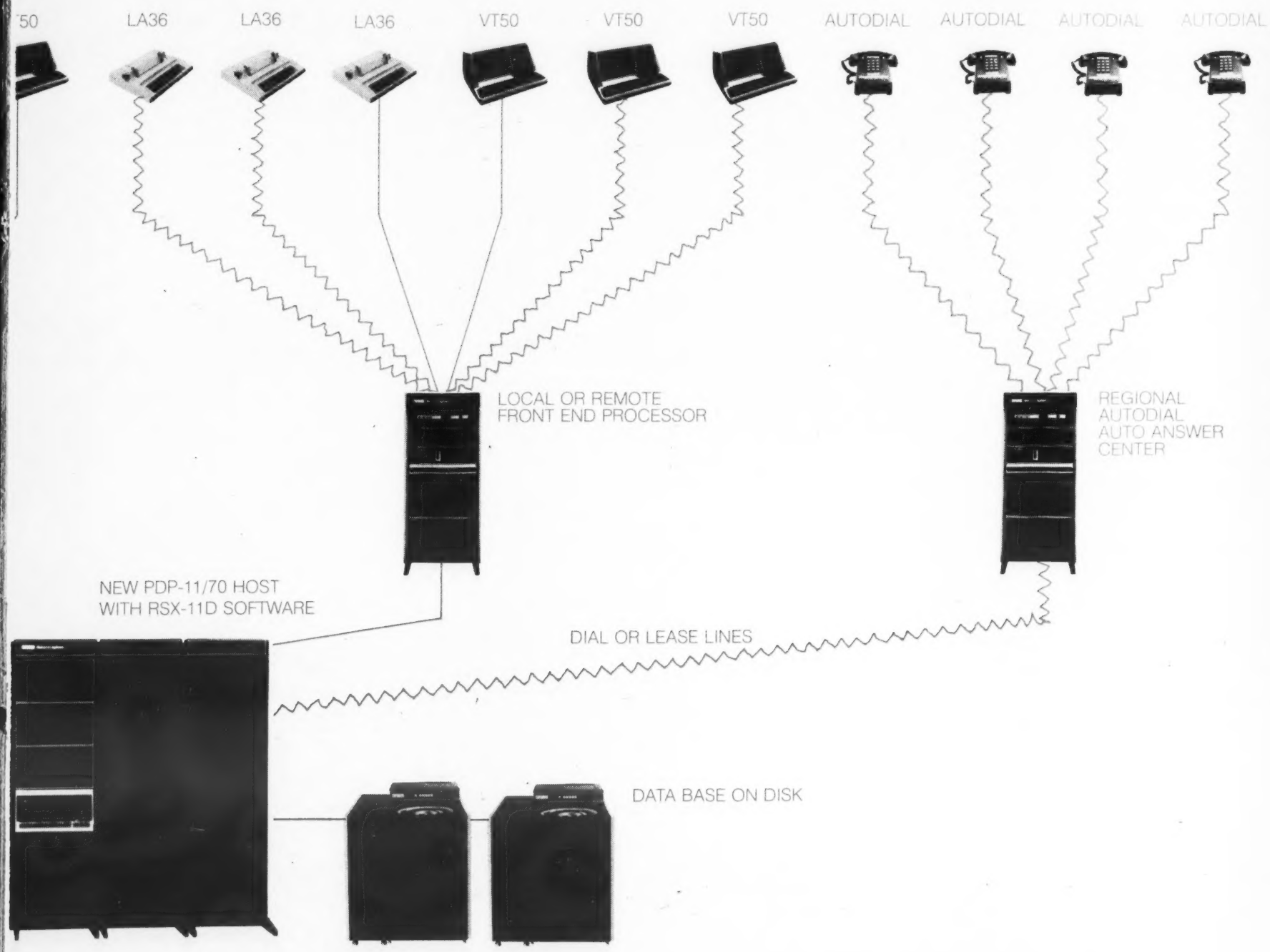

Terminals, Carrier Services Spotlight Exhibit Floor

By Ronald A. Frank
Of the CW Staff

SAN FRANCISCO – Terminals and carrier services were among the displays of more than 90 exhibitors at the annual conference of the International Communications Association (ICA).

Codex Corp. demonstrated its selective repeat Automatic Repeat Request (ARQ) unit, which is said to increase the transmission efficiency of binary synchronous terminals operating on satellite channels.

The selective repeat ARQ device essentially introduces a buffer at the receiving and transmitting end of a satellite link, thereby masking the effects of the propagation delay.

A simulated satellite link was demonstrated with two Datapoint 2200 CRTs operating in IBM 2780 emulation mode at 4,000 bit/sec. By effectively masking the delay, transmission efficiency can be increased from 50% to 92%, a Codex spokesman said.

The Codex unit is compatible with various terminal protocols. While not eliminating the round-trip satellite delay, it is designed to minimize the effects for high-volume, batch-oriented applications which use common synchronous protocols. It costs $8,500 from Codex at 15 Riverdale Ave. in Newton, Mass. 02195.

The Data Transmission Co.'s (Datran) switched Digital Datadial Service was demonstrated utilizing the 40+ display terminal from International Communications Corp. (ICC). Datran used the Digital Circuit to send a 2,400 bit/sec transmission from one CRT in its booth to another using the Datadial switch outside Chicago.

ICC showed the 40+ by using the same Datadial net and adding an analog link from the Dallas Datran terminal to a Digital Equipment Corp. PDP-8 in Miami. The analog portion operated with two split-stream 2,400 bit/sec channels derived from a pair of ICC 4,800 bit/sec data sets.

CW At ICA

Western Union Data Services showed its latest version of the General Electric Terminet 30 teleprinter for the first time. The terminal can operate at 30 char./sec on dial-up lines or 10 and 15 char./sec on the TWX network.

Southern Pacific Communications (SP) announced at the conference that its specialized carrier network is operational coast-to-coast using SP facilities. The 4,000-mile network now serves 17 states and 45 cities.

The latest link to be opened runs from Cleveland. through upper New York State to New York City. Boston is scheduled to be added later this month, the company said.

Communications Sciences introduced its Optimizer software package designed to optimize the routing of phone calls over least-cost facilities. A user is said to save between 10% and 20% of monthly long distance phone bills with the use of a customized Optimizer package, the firm said.

This savings can be increased if the user installs a minicomputer or electronic PBX, the firm claimed. Communication Sciences is based in Newark, N.J.

CDC Net Links UK Universities To London Center

LONDON – Universities throughout southern England and Wales, which a few years ago could hardly hope for even medium-scale computing facilities, now have access to one of the world's largest computer complexes devoted entirely to education.

In once-medieval centers of learning – Bath, Bristol, Oxford, Sussex, Surrey and others – university students use remote terminals and small-scale computers to communicate with four Control Data Corp. CPUs at the University of London Computer Center.

Services Integration

In order to provide efficiency as well as economy of operation, data communications for the remote universities were designed for integration of local computer services with those at the London center.

For example, data communications to the distant universities are through a single computer into that network. Jobs created within the network are submitted through a single line to the London center. Eventually, most users will submit jobs to the London computers through their own systems.

Where remote terminals are the lone method of data input, these are primarily CDC 200s with private or dial-up lines operating at 2,400 bit/sec.

At the University of London Computer Center, the four CDC systems, a 6600, 6400, 7600 and Cyber 72, are linked together.

NETWORK

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With this kind of system you'll get faster response. Because each computer in the network has fewer jobs to do.

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And since high-cost signal cables between your processes and a central computer are replaced by inexpensive communications lines, the money you save can often pay for the satellite computers.

Programmers at the host computer can compile programs for any or all the computers in the network. And when they're through compiling, editing, and debugging a program, they can load it directly down to the satellite. Whether it is next door or a thousand miles away. With

Westinghouse Manager Advises

Personal Contact Needed to Establish Overseas Nets

By Ronald A. Frank
Of the CW Staff

SAN FRANCISCO – American companies planning to operate international telecommunications networks must establish personal contact with each of the governmental administrations that control these services.

"If you don't make personal contact, it can be disastrous," according to Robert Bennis, manager of telecommunications for Westinghouse.

Describing the experiences of his company in establishing its international network, Bennis told an International Communications Association (ICA) conference session here recently that European telecommunications administrations are not anxious to approve intra-Europe private line facilities or interconnections with switched dial-up nets.

In many cases, a private line link with another European country is regarded as taking away potential revenue that would come from direct lines to the U.S., Bennis explained. Sometimes the user can get intra-European approval if he makes a commitment to also establish a link to the U.S., he added.

CW At ICA

Foreign administrations are not very customer-oriented, but larger users are beginning to make some progress to overcome the existing roadblocks. Many of the options taken for granted by companies in this country are not available to users in other countries, especially in Europe.

The user has to operate according to the "rules of the road" in each country, Bennis advised, but he also predicted that, in the next five to eight years, the European administrations would begin to offer more of the data and other offerings that are available in the U.S.

Higher Rates

Rates charged by overseas carriers are usually higher than those charged by international carriers operating in the U.S. Typically, on a trans-Atlantic link, the customer pays one-half of the circuit cost each month to the U.S. carrier and one-half to the European carrier.

On a link between the U.S. and Belgium, Westinghouse pays 33% more for the European half of the line than it does for the U.S. half. "We don't quite understand why there should be this discrepancy," Bennis said.

There seems to be a trend to widening the differential between the rate charged for the U.S. half of a link and the overseas half. For billing purposes, the user pays the U.S.-based carrier for the monthly cost of a line from the U.S. gateway city to mid-ocean, and he pays the European carrier or government administration for the other half from mid-ocean to the European gateway city.

As an example of higher rates being considered in Europe, the European administrations are considering affixing a surcharge to lines which can be interconnected to public switched nets from private line links.

A 23% surcharge is being considered and "this is typical of the shortsighted views of the foreign administrations. They have not yet gotten the message that effective communications for us means a lot of business for them," he said.

If the trend continues, the foreign administrations will make it uneconomical for U.S. firms to operate in their countries, he added. Both Westinghouse and Xerox have objected to the proposed surcharge, Bennis told the attendees.

And, if trends toward rate increases also continue, it will be even more important for U.S. firms to establish personal contacts with foreign administrations so that goals for telecommunications are clearly understood, he said.

One of the poorest communications environments exists in Puerto Rico, Bennis said. The government in 1974 purchased the local phone company from ITT and has now decided it is not under the jurisdiction of the Federal Communications Commission. Among other things, it has decided not to allow the interconnection of independent equipment, he said.

Among the more cooperative administrations, he cited those in England and Belgium.

Correction

The Logabox terminals [CW, May 14] are hard-copy printer terminals.

DIFFICULTY.

at remote plants. But if an engineer or scientist stationed at a satellite wants to compile his own program. No problem. He calls down language processors from the host. Compiles and edits the program on his own satellite computer. And sends his listing outputs back to the host for printing.

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We might or might not recommend a DECwriter II for your operation. If we don't, it'll be because we can give you even better cost efficiency another way. Challenge us. For more information, write: Data Dimensions, Inc., 51 Weaver Street, Greenwich, Conn. 06830. Or better yet, call Bob Loonin at (203) 661-1700.

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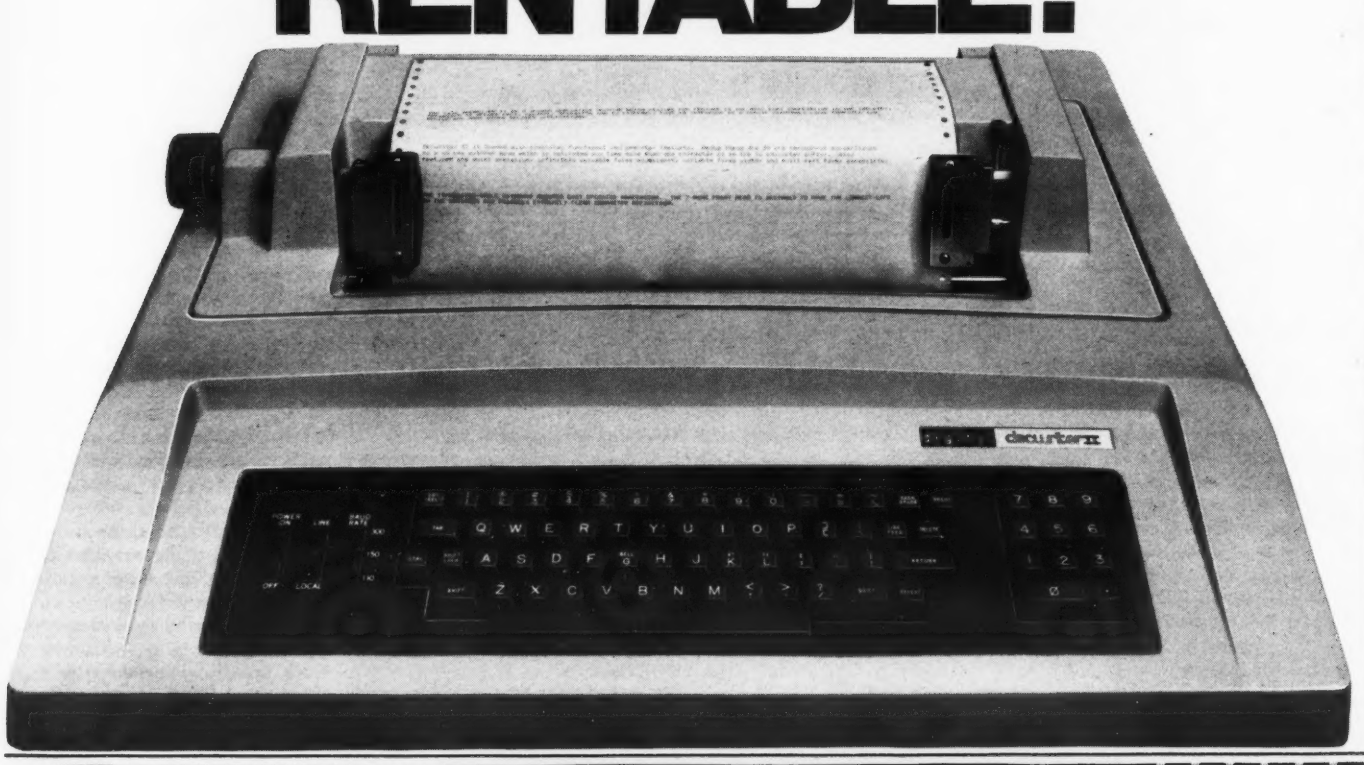

TI DXS Features Video Terminal

HOUSTON — A distributed data processing system, the DXS Data Exchange System, with an intelligent CRT terminal is available from Texas Instruments, Inc. (TI).

The DXS is an expandable transaction processing system for distributed data base networks. It uses TI Model 960B minicomputers for transaction processing and disk file management, terminal communications and optional host interface.

A feature of the system is the Model 914A video terminal, which enables stand-alone transaction processing or communication to IBM 360 or 370 host systems. The 194A provides IBM 3270 emulation.

The Model 914A terminal incorporates a microprocessor with 8K bytes of memory for intelligent data entry and inquiry response to DXS or host 360/370 data files with 3270/2260 emulation. The 1,920-character screen provides programmable field formats, protected and nonprotected fields and a range of field editing functions.

An optional parallel printer interface enables direct connection to 80 or 132-column printers. The 914A terminal is priced at $3,200.

Two Configurations

The DXS is available in two basic configurations: the DXS-20 with up to four 2.2M-byte cartridge disk storage units and the DXS-40 with up to four 100M-byte disk drives.

Each basic system will support up to 64 Model 914A terminals on a combination of up to 11 local and remote communication lines at 1,200- to 9,600 bit/sec speeds. System expansion capabilities include supporting up to 256 terminals on a combination of up to 44 local and remote lines.

The DXS is supported by a full complement of peripherals including 300- and 600 line/min printers, Model 733 KSR console teleprinters, 800- and 1,600 bit/in. 9-track tape drives, card readers and an optional 960-character screen Model 913 video terminal, as well as the disk drive units and Model 914A video terminals.

DXS system prices range from $66,000 to $250,000, with extended-term leases available. Delivery is currently quoted at 60 days from TI at P.O. Box 1444, M/S 784, 77001.

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Bits & Pieces

Data View Adds Readers

MENOMONEE FALLS, Wis. – A line of Computer Output Microfilm (COM) readers from Data View, Inc. puts the light source at the top and the lens at the bottom of the unit to keep extreme temperatures away from the film, provide better brightness and resolution and a unique level of modularity, according to the firm.

The reader design provides for interchangeable lenses, carriages, illuminating modules and screen sizes, a spokesman said.

The firm is currently producing a $185 unit that provides a three-quarters image of a COM page. Another unit providing either the three-quarter COM image or full-size conventional image will be available at the end of the month for $185; a full-size COM page reader will also be in production by then for $245, the firm said.

The firm also plans to introduce a $1,000 electrostatic printer within about six months that could convert any of the firm's readers to a reader/printer.

Data View is at P.O. Box 537, 53051.

Broomall Introduces M-2916 Plotter

BROOMALL, Pa. – The M-2916 incremental plotting system from Broomall Industries produces plots from 9-track, 1,600 bit/in. phase-encoded magnetic tapes.

The M-2916 system includes a controller, 45 in./sec tape drive and one of the company's plotters.

An M-2916 system costs from $27,900 to $34,900, depending on the plotter selected, from the firm at 682 Parkway, 19008.

Computervision Digitizer Low-Cost

BEDFORD, Mass. – Computervision Corp.'s Large Tablet Digitizer (LTD) is said to be a low-cost digitizing terminal for input of graphic data to the company's Designer interactive graphics systems.

The LTD has a 35-in. by 47-in. active digitizing surface, including a menu area. The digitizer head has no mechanical connection to the table, allowing freedom of hand movement for the operator, the vendor noted.

The LTD is also an "absolute digitizer" – any point on the digitizer surface has absolute, permanently defined coordinates, rather than relative coordinates which refer to an operator-defined origin, the firm said. If power is interrupted, or if the operator lifts the cursor from the table surface, coordinates are not lost.

The LTD costs $10,000 from the firm at 201 Burlington Road, 01730.

With Peripherals, Memory

CDC Enhances Medium-Scale Models

MINNEAPOLIS – Disk, tape, printer and main memory improvements by Control Data Corp. enhance the performance of CDC 3170, 3300 and 3500 medium-scale computers that use the CDC Master operating system.

Peripheral controllers, in addition, enable users of CDC 3170, 3300 and 3500 computers to add higher performance magnetic disk and tape drives to their systems.

The company also introduced a compact main memory addition for its 3300 computers that, it claims, will reduce physical space, power and cooling requirements by as much as 85% compared with memory previously offered.

At the same time, the company noted users of CDC's lower 3000 series computers now can add a 2,000 line/min printer, the CDC 580, for improved system effectiveness.

The CDC 3554-1 mass storage controller regulates data transfer of from one to eight CDC 844-21 disk storage units, connects to a single 3170, 3300 or 3500 system input-output channel and includes a small programmable processor to aid in system diagnostic and recovery procedures, the company said.

A single controller performs multiple overlapped seek operations concurrently with one read or write operation. Two controllers in a subsystem allow two simultaneous data transfers, either read and/or write, to any two drives while retaining the multiple-seek feature.

Eight Drives Maximum

Data capacity of each 884-21 drive is 118 million 6-bit characters, and a maximum configuration of eight drives provides 944 million characters of disk subsystem memory. These drives provide more than three times the previously available disk storage and faster data access for CDC 3170 and 3300 system customers, the company said.

In addition, data is transferred to a CDC 3500 computer at a rate of 1.2M char./sec, some three times faster than previously had been possible.

Magnetic Tape Controllers

The CDC 3521-1 and 3521-2 magnetic tape controllers offer two features for users of CDC's lower 3000 series computers, the company said – 200 in./sec transport speed and a 33% performance improvement in data transfer. These controllers provide the interface between CDC 667 [7-track, up to 150,000 char./sec transfer] or 669 [9-track, up to 320,000 char./sec transfer] tape transports and the central computer equipped with CDC's Master 4 operating system.

Each controller contains a subsystem processor, tape control unit, matrix circuits, a 4K-word memory system and channel coupler. The subsystem processor uses controlware to communicate with the higher level processor, to send operating commands to the internal tape control unit and to monitor subsystem activity.

The internal control unit handles transport activity, performs code translations and transfers data between coupler and transport.

It also performs error correction and detection, the company said, so this need not be done by the computer's operating system.

All communications transmission, reception and switching between transports and the logical tape control circuitry is accomplished by the matrix circuits.

Memory Add-on

The CDC 3373 add-on memory system incorporates core memory planes and integrated circuit logic to reduce by 85% the space, power and cooling required for operation, according to CDC studies of current 3300 system installations.

A basic system contains 16K words of storage that can be expanded in 16K-word increments to a maximum capacity of 128K words. All memory increments are contained in the basic system cabinet. Addition of a second 3373 memory system will allow system expansion up to 256K words.

Double-Bit Error Detect

Each memory word contains 24 data bits and seven syndrome bits that accomplish single-bit error correction and double-bit error detection. The memory is fully compatible with currently installed CDC 3300 system memory and can be accessed by up to two 3300 central processors and two communications multiplexers with the addition of optional access channels.

Prices and Delivery

CDC's 3554-1 disk storage controller will be available during the fourth quarter for $94,500 purchase or $1,850/mo on a one-year contract. Basic monthly maintenance is $322. Purchase, lease and maintenance prices for the CDC 844-21 disk drive are $29,400, $596 and $112, respectively.

The basic 3373-1 add-on memory system and expansion modules will be available in the second quarter of 1976. Purchase, monthly lease and maintenance prices for the basic system are $90,990, $3,250 and $420, respectively. The additional memory modules can be purchased for $16,000, leased for $570 per month and maintained for $40 monthly.

Purchase prices for the single and dual processor CDC 3521 magnetic tape controllers are $28,875 and $63,525, respectively; monthly lease charges are $624 and $1,439; maintenance is priced at $145 and $300 per month.

Prices for the tape transports vary according to recording and performance characteristics and begin at $19,425 for the Model 667, $20,213 for Model 669. Monthly leases start at $344 and $355, respectively. Maintenance is either $125, $140 or $156, depending on the transport selected.

Univac Offers Real-Time System For Savings, Loan Institutions

BLUE BELL, Pa. – Real-time financial systems for savings banks, credit unions and savings and loan associations were announced by Univac.

Offered in two hardware configurations and featuring Profits, a software package specifically designed for the "thrift business," Univac 9480 Financial Systems are said to provide price/performance benefits for small- and medium-size savings and lending operations.

Purchase price of the 9480/F1, a system with a separate printer and card reader, is $353,664. Monthly rental for this model under terms of a five-year lease is $7,495 including maintenance. A Univac 1004 subsystem provides card reading and printing functions for the 9480/F2 which can be purchased for $324,499. Monthly rental and maintenance is $7,091.

Profits' Central Information File (CIF) can produce a complete profile of any account when the name and address of the depositor or borrower is entered on a terminal.

The 9480 Financial Systems are said to be able to process all types of transactions required in deposit savings accounts, loan mortgages, pass book loans and installment, construction and commercial loan accounts.

Both Univac 9480 configurations include 131K memory, two Uniservo VIC 9-track tape units, three 8414 disk units and "basic control" for up to four communications lines.

Deliveries to customers are scheduled to begin in October.

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RAYTHEON

Sharing 'Pads' Cuts Six Cities' Costs

IRVINE, Calif. – Six cities in Orange County have combined their resources to reduce the cost and increase the efficiency of data entry from remote locations into a centrally located computer system.

The dispersed data entry is handled with System 480 key-to-disk data entry systems manufactured by Entrex, Inc.

The six cities in the program are Brea, Buena Park, Costa Mesa, Fountain Valley, Placentia and Tustin.

They have formed a joint venture called Public Agencies Data Systems (Pads) to handle a number of DP tasks, including a payroll system for about 1,500 employees in five of the member cities, a personnel management system and an extensive financial management system.

The cities have combined total operating budgets of approximately $35 million for fiscal 1974-75.

Member cities have installed single Entrex Data/Scope keystations in their city halls. Data for the computer is entered through a keystation and then transmitted from the cities over telephone lines to the System 480 control group in Irvine.

Although the Pads IBM 370/145 computer is in Irvine, that city is not part of the program.

Marvin S. Ruth, director of management information systems at Pads, said that with the Entrex system:

- Each city is able to edit, revise, update and inquire into certain temporary files.
- Each city has eliminated more costly keypunch services and associated card handling and card costs.
- Source documents from which data is gathered remain in the individual city halls, thus providing more control of input data and greater security.

In addition, because of the ease with which the operation of the Entrex equipment can be taught, the cities are able to handle error detection and correction with clerical personnel, he said.

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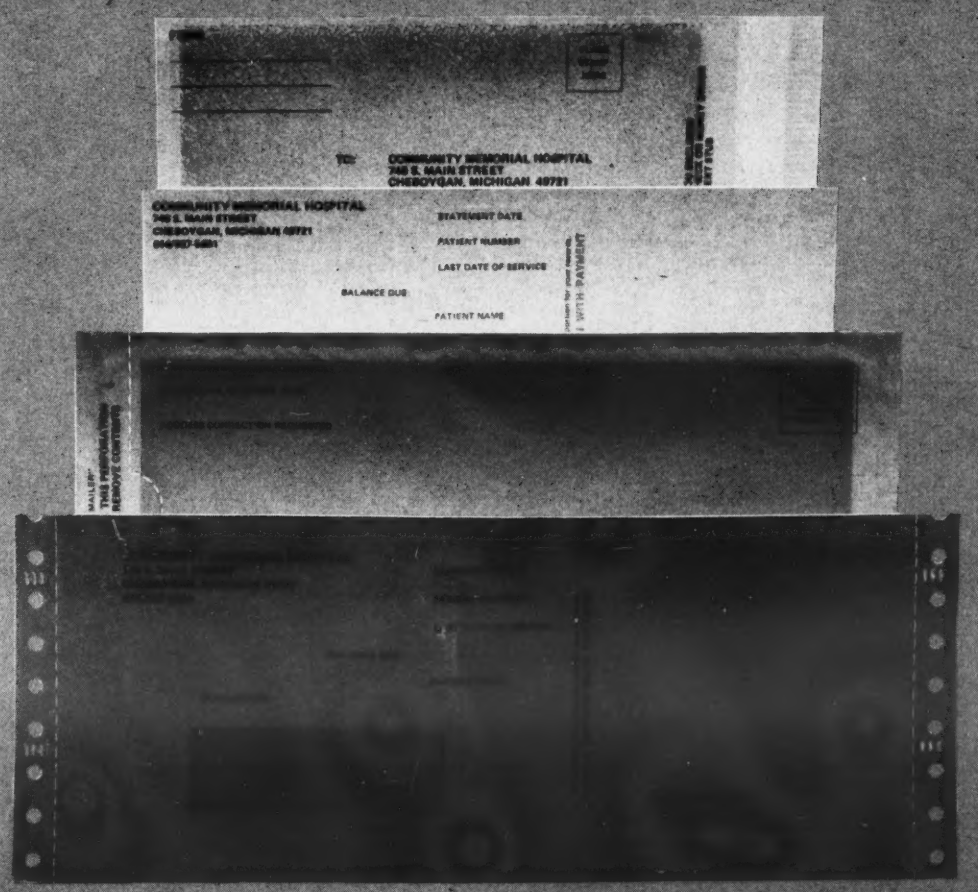


Curtis 1000 is a member of the American Business Products family of companies and is the principal national marketing arm of ABP.

T/S System Aids Japanese Firm

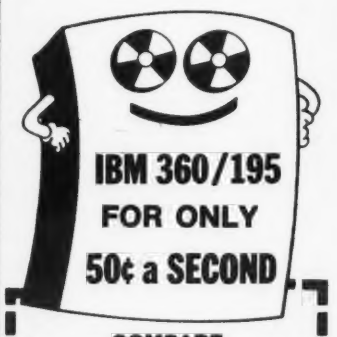
TOKYO – A companywide time-sharing system has been inaugurated by Nippon Pulp Industry Co. Ltd., utilizing a Univac 1106 system supplied by Nippon Univac Kaisha Ltd.

Employing high-speed data communication lines, the system links the 1106 at the Tokyo headquarters with terminals at the company's Nichinan and Yonago plants.

Prior to installing the 1106, Nippon Pulp used competitive equipment with separate computers installed at its various facilities. This arrangement proved unsatisfactory because management was unable to obtain an integrated picture of order and production status.

The 1106 provides integrated control of data and ease of access to information stored in the computer's data base.

The major application for the system involves order entry, including order processing and delivery scheduling.



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In DP Centers

Many Factors Determine Amount of Security Needed

By Paul R. Visokey
Special to Computerworld

Just how much is enough security for a data center? The answer comes from its location, physical layout, physical structure, field of work and the extent, if any, of its history of arson or espionage.

A shopping list for a well-integrated security system should have, at or near the top, access control. Obviously, any well-run system or device to keep unauthorized people from the computer and the tape libraries can deter outside saboteurs, burglars posing as employees or even collusive fraud between employees.

Access control is often achieved in computer areas by stationing an employee at the only entrance to check credentials of entrants. He might also keep all keys for the building and its computer room and require employees requesting a key to sign their name and the time of issuance in a log book. At the end of each day, he would account for all keys.

Card access systems, by comparison, include encoded plastic cards which serve as keys to unlock either all doors, including tape storage areas or even file cabinets containing classified information. In effect, the card is a magnetic key and a "keyport," installed beside a door or on a cabinet, is a lock.

The system's advantage is it usually costs less than a guard service and, ulike locks, is very difficult to pick or defeat. These plastic cards, which include a photograph of the bearer, can also double as employee identification badges.

When a card is inserted into the keyport, the keyport "reads" its magnetic code and transmits the reading to the control console which in turn can print out a hard-copy log. Larger centers station a guard at the console and make monitoring the log one of his duties.

Since recently fired employees with real or imagined grievances sometimes become arsonists or saboteurs of their former employer, keys or "keycards" should be confiscated from them. Where this is not feasible, an access system with a central controller enables management to void the employee's card code so it will no longer open the center's entrances and may cause an alarm.

Internal Fraud

The keyless-card access method also works well against internal fraud. Often fraudulent manipulation of a company computer requires a computer programmer and computer operator to work closely together. Such frauds can occur if the programmer has easy access to the computer or the operator to the programming area. But the card access systems can be designed so only some cards open some doors.

Larger computer centers or ones with "more to lose" back up their access control system with cameras or closed circuit television (CCTV). Having cameras situated in high-security areas discourages theft and dishonest behavior of all kinds.

CCTV usually is used when a guard monitors operations and access ways from a centralized console on the premises. On the console's panel would be visual or audio annunciators to signal any incipient fires, break-ins or authorized entries throughout a large building.

The cameras situated in the center can transmit images of the key access ways and computer area to monitors in the console.

In addition to protecting against unauthorized entry when the center is open, a computer facility must be controlled after-hours against fires and burglaries. Systems presently available provide immediate detection of a break-in attempt or fire and a ready and effective response.

The four basic alarm systems are: the local alarm, direct-connect system, central station and the proprietary system. Each system provides a different degree of security with a different emphasis.

The most basic is the local alarm system. It can be used by itself in premises where a security supervisor is always present. Essentially, the local alarm senses a break-in and sounds an audible warning signal with automatically triggered bells, gongs, sirens, etc.

Sometimes local alarm systems are used as a backup system to a more comprehensive setup which transmits a "silent" signal either to a police station or central station. In so doing, employees at the center and an outside response force are all alerted to an emergency. More often, though, such a system will frighten away an intruder.

Direct-connect systems are designed to sense intrusions or fires and transmit a warning signal manually or automatically to an alarm in either the local police station or fire department. They are particularly effective when the police or fire department is nearby.

But direct-connect service becomes less effective if the installation is isolated. An immediate response to a signal is also not guaranteed.

Central Station Service

Central station service has security supervisors on duty around the clock. When a signal comes in, the supervisor notifies a patrolling guard service, the local police, fire department or whomever else the subscriber specifies.

The second advantage to central station systems and proprietary systems is they can be designed for early detection of temperature irregularity in climate-controlled areas; fires or the signs of fire; break-ins, and breakdowns in computers or plant machinery.

It is sometimes asked if a shrewd burglar can defeat one of these systems simply by snipping a few transmission wires to either the police station or central station.

Fortunately, these systems can be secured, so tampering of the protected lines will sound an alarm like any break-in. Typically, security systems also have independent, battery-operated sources so they can function even when power to the premises is knocked out.

Visokey is a manager with ADT Security Systems.

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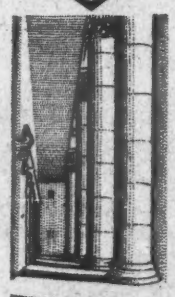

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Solves Common Dilemma

NCR Century 101 Serves Five Colorado State Agencies

MONTROSE, Colo. – Many local government agencies in rural areas face a common dilemma. They lack the accurate and timely information necessary for effective decision making, yet they can't afford to buy the computer capability which would meet their needs.

A solution which could provide a model elsewhere has successfully been implemented here, in a community with a population of 7,000 on the western slope of the Rocky Mountains.

For more than three years, the Montrose County Service Corp. has been providing DP to the city, the county, a 75-bed hospital, a 4,450 student school district and a water conservancy district.

"What we consider unique about our approach," said Montrose city manager James Austin, "is the center has no dominant user. Everyone is coequal.

"Before we even began consideration of a vendor, the five participants signed a noncancelable, five-year agreement whereby they pledged to pay a preset percentage of the estimated annual cost."

In 1971, when planning began, the budget was set at $90,000. Thirty percent each was supplied by the city, the county and Montrose County School District No. Re-1J and 10% each by Montrose Memorial Hospital and Tri-County Water Conservancy District.

The 10% overage was to be carried over or used as a contingency fund for unseen expenses during the first year of operation which began in January, 1972.

Pro-Rata Basis

Now, in the service center's fourth year of operation, the annual budget has climbed to just under $134,000, and the five governmental agencies are assessed on a pro-rata basis according to actual machine usage.

Frank Walls, the data center director, reported his is currently running 20% each for the city and county, 27% for the school district, 28% for the hospital and 2% for the water district.

The remaining 3%, Walls said, is accounted for by a Montrose business which has contracted for accounts receivable and general ledger processing.

"The original governmental participants can always drop out, of course, but then they would be required to pay the original pro-rata percentage of operating costs," Austin noted.

As examples, the city manager cited the following:

- For the hospital, the first-year savings from its inventory program alone was several thousand dollars, primarily in the several supply and related departments. The savings were afforded due to careful control and faster turning without overstocking of items, thanks to a complete inventory every week.
- For the city's water and sewer utility – which is separate from the tri-county water district – the monthly billing for 2,500 customers takes only two hours for data preparation and three hours of computer processing.

"By way of contrast," Walls said, "a nearby community of 5,500 in an adjoining county has 1,700 electric utility and 550 water utility customers. Using conventional billing machines, it takes them two weeks just to prepare the bills and another week to address them.

"That's less than one day of work vs. 15. Because of this, the nearby community is giving serious consideration to contracting with the Montrose center for its billing. I estimate the savings could be a minimum of $16,000 a year."

Reports Timely

Penelope Patterson, Montrose's finance director, noted the month-end general ledger reports are now routinely being delivered within five working days after the books have been closed for the period. Other reports are just as timely.

The city, county, school district and hospital all have computerized general ledgers with budgetary encumbrances. Other applications – there are more than 300 all told – include payroll for the city (95 persons), school district (390) and hospital (215); 2% city sales tax; 30 special city funds; county road and bridge accounting plus tax rolls and notices and voter registration.

Each of the governmental users has two appointed representatives on the non-profit computer center's board of directors. Walls is the 11th member. After the consortium decided upon the major thrust DP should take, the next step was selection of a hardware vendor.

Only two manufacturers were considered, Austin said, because none of the others could provide the service support which was considered essential. The NCR Century 100 computer was chosen over the competing system on three grounds, the city manager said.

"One was the price performance ratio," he continued. "NCR simply gave us more processing power for less money. Since we knew the center's workload would grow, we were also favorably impressed by the Century family's provision for upgrading without having to rewrite all of the software.

"Finally, we have backup in that there are two NCR Century systems in Grand Junction, which is only about 60 miles north of us. The company has stationed a full-time serviceman here in Montrose, but if worse came to worst, we could take our disk packs to one of the other sites and rent time."

Downtime Reduced

To date, there have been no such inconveniences. Walls said downtime has been reduced from 15% when he joined the center in 1974 to 2.5% today.

Provision for an expandable system proved wise, for more applications have been written on a continuing basis. In September 1974, the center, which prefers to buy hardware on a lease-purchase plan, traded the Century 100 for the more powerful 32K Century 101.

The system has four spindles for 5-million-character magnetic disk packs, two fixed and two removable. As one indication of the computer's flexibility, Walls cited the options for creating input.

The city, county and school district all use NCR 736 magnetic tape encoders; the water district uses punched paper cards; and the retail business creates punched paper tape which is converted to magnetic tape. With the variety of input capability, this allows the center a high degree of flexibility to meet almost any size business requirements.

Besides Walls, the center has two systems analysts, one lead operator and an encoder-junior operator. At present, working just one eight-hour shift five days a week, the computer is being used 175 to 180 hours a month, Walls said, providing built-in capacity for more than twice as much additional processing.

"We also have some options on peripherals," he said. "Our 250 line/min printer is relatively slow, for example, and it would probably be more economical to upgrade that before hiring additional personnel. Then we also have the option of increasing individual disk pack capacity from 5 million to 30 million characters."

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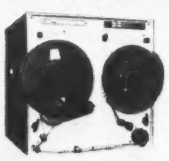

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Of Minis and Micros — Part 1

Advantages Outweigh Concerns For All DP Service Suppliers

By William R. Roach
Special to Computerworld

Minicomputer and microcomputers are here to stay . . . and service bureaus and even large, in-house computer centers must be able to use these tools to benefit their users. The alternative is technical and cost/performance obsolescence.

The architecture, general nomenclature and many end-user applications are similar for both minicomputers and microcomputers. The differences, however, are substantial.

Minicomputers use discrete technology, which means basic logic functions are each separate components – either boxes or separate groups of circuits.

In microcomputers, most of these functions are integrated on one or just a few individual chips. As a result of this use of advanced state-of-the-art technology, prices of microcomputers can be less than one-tenth the price of minicomputers.

However, there are limitations currently in the capacity of microcomputers due to present microcircuit manufacturing technology. These limitations will be eliminated in the future.

Another reason for the lower price is the software for microcomputers is only now emerging, whereas minicomputers have relatively established operating as well as applications software in many cases.

Support for microcomputers is almost nonexistent at the present time whereas minicomputers usually offer a "no frills" support.

It is important to note the microcomputer is still emerging, and almost every vendor can specify different definitions and different objectives for current product design. But the key point is microcomputers and minicomputers are similar in function and architecture, and the differences have to do primarily with capacity, price, software and related support levels.

There are several different ways in which minicomputers and microcomputers can impact large computer services groups.

A customer, for example, who purchases a Basic/Four system or an IBM System/32, no longer will need a computer service vendor for his primary DP activities. A larger company which uses extensive outside time-sharing services can, for example, purchase a Hewlett-Packard 3000, or a Digital Equipment Corp. or Xerox System and pull this outside expenditure in-house.

As the cost of peripherals, printers and low-speed terminals declines, in-house minicomputers will become even more common.

Microcomputers are also capable of replacing some minicomputers and carrying out similar functions at a substantially reduced cost. Thus, most of the impact of minicomputers will be felt more strongly as a result of microcomputers.

These impacts mostly sound negative for large computer service suppliers, and this is what has been widely published in the press and trade journals. But is this really the case? . . . Definitely *not*.

Suffice to say that only in the case of small business computers should service vendors be extremely concerned. In the case of all other impacts, any concerns are more than outweighed by the opportunities that exist for exploiting the benefits the minicomputers and microcomputers offer computer users.

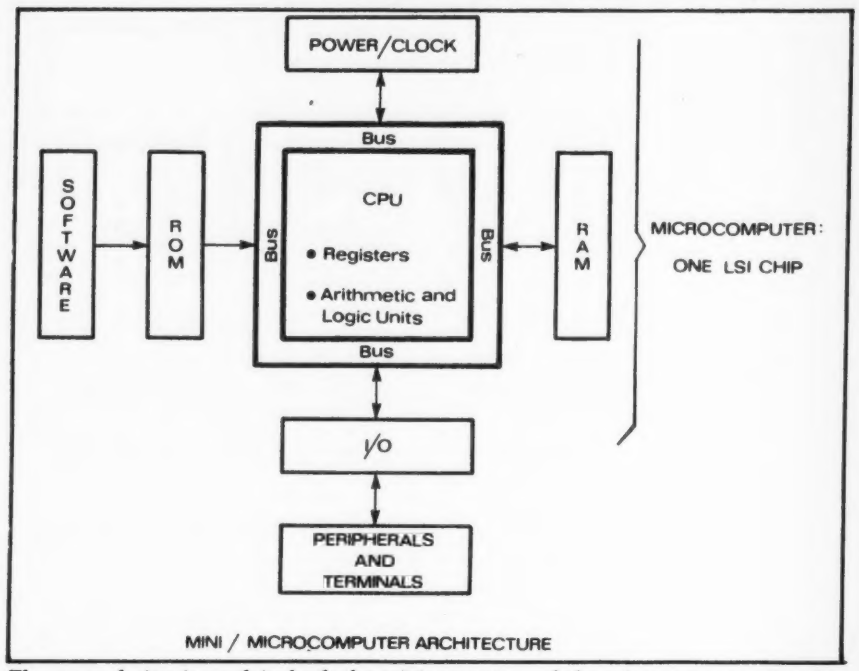
For example, an enhanced terminal or an enhanced data collection system made possible through a microcomputer can lower the cost of providing services as well as reduce the cost of in-house computer operation.

This factor, combined with the inherent economic advantage of providing computer services on a shared-cost approach suggests that, at worst, the services suppliers will be no worse off than before, and, at best, will be able to take faster and more opportunistic advantage of the technical developments, providing new approaches, services and specific applications to users.

Roach is executive vice-president of Optimum Systems, Inc. in Palo Alto, Calif.

	MINICOMPUTER	MICROCOMPUTER
SIMILARITIES	• Architecture • Nomenclature • Many Applications	
DIFFERENCES	• Discrete Circuit Technology • Price $3K to $25 K • Word Size 8-32 bits • Main Memory Size 4K-16K Words • Established Software • "No Frills" User Support	• Integrated Circuit Technology • Price $500-$1,500 • Word Size 4-16 bits (current) • Main Memory Size 500-4K Words • Emerging Software • Almost No User Support

Minicomputer vs. Microcomputer



The same design is used in both the minicomputer and the microcomputer, but the bracketed system components are integrated on one or several very small integrated circuit chips.

For 66 Public Schools

Food Service System Inventories Central Supply

DAYTON, Ohio – The Dayton Public Schools Food Service Center is using a minicomputer to inventory a central supply house that issues supplies to 12 schools and prepackaged lunches to 54 others.

Betty Bender, food service supervisor for the center, found she needed a more sophisticated approach for deliveries, expenditures and income available.

This was becoming increasingly necessary as the center grew to a yearly food supply expenditure of over $2 million and 4,036,000 meals served. She was instrumental in the purchase of an HP 2000 minicomputer with terminals to solve the dilemma.

Now, as supplies, food, cleaning items and paper needs are delivered to the center, their quantity and cost are immediately entered into a terminal. They are then either stored in a warehouse at the center or sent out to one of the twelve school cafeterias in the area.

Because the inventory and costs are constantly updated, Bender can approach the terminal and find out exactly how much inventory she has on hand at the various locations.

She can also access information such as profit-and-loss statements, year-to-date usage and pricing. Thus, a complete picture of all goods on hand is available in an updated form every day. This knowledge plays an important role in future plans and orders.

The 54 schools that don't have cafeteria facilities receive from the center hot and cold lunch packages. These resemble airline dinners and are prepared at the center kitchen daily. The total number of lunches issued to each school is recorded in the computer, and each school is charged accordingly.

This information is relayed through a terminal to the service's administrative building, where the figures are checked with a lunchroom balance sheet that is completed by each school receiving lunches. This system allows for accountability of each lunch prepared and simplifies billing and government report procedures.

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Little things that count.

Read all about them in our June 25th supplement, "Minicomputers and Small Systems."

Minicomputers are getting bigger and smaller than ever these days, and they are subject of a special report in the June 25th issue of *Computerworld*. Edited by Vic Farmer, this special supplement will focus on problems and solutions in minicomputer applications and system integration. Drawing on the real-world experience of other users in situations like your own, special emphasis will be given to money-saving ideas. You'll see application stories and tutorials on topics like these:

- **The benefits and drawbacks of time sharing on a large system versus owning a small minicomputer system.**
- **How to recognize and solve problems in interfacing and system integration.**
- **When to call for help - minicomputer consultants and outside software packages.**
- **Satellite system networks - minicomputers as processors in data networks.**

If you're using minicomputers or are considering one, you should be reading this special report in the June 25th issue of *Computerworld*. And if you're a marketer in the minicomputer industry, your ad should be there. Ad closing is June 6th. For complete details, contact your area *Computerworld* representative. Or call Judy Milford or Sara Steets at (617) 965-5800.

COMPUTERWORLD

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Bright Unit Runs At 125 In./Sec

SUNNYVALE, Calif. – Bright Industries is now manufacturing its Model 2760, a 125 in./sec vacuum column-digital tape drive.

The unit is part of the 2700 series of drives with over 80% parts interchangeability, according to the firm.

Each drive in the series has an industry-compatible interface and operates in NRZI and phase-encoded formats at densities of 1,600-, 800-, 556- and 200 bit/in., the company said.

The 125 in./sec unit has a built-in daisy-chain capability, three read thresholds and an overwrite (edit) feature. On quantity orders, the price is about $5,500 each.

The drive features IBM-compatible, 10.5-in. reels, quick release hubs and simplified maintenance. Due to the interchangeability of parts in the 2700 series, spares inventories and maintenance training are dramatically reduced. The company is at 686 W. Maude Ave., 94086.

GEM Memory Expands Lockheed MAC to 64K

LOS ANGELES – Lockheed Electronics Co., Inc. MAC systems can be increased up to 64K 16-bit words in a single chassis with the firm's General Purpose Expansion Memory (GEM).

By utilizing the GEM expansion as the total system memory, maximum utilization is made of the MAC mainframe chassis for input/output controller space. The expansion memory operates at one μsec cycle time and is constructed in 8K-word increments.

The GEM with 8K words is priced at $4,150; with 8K expansion units, $1,650; a complete 64K-word memory is $15,100.

A basic MAC 16 computer with memory expansion adapter is priced at $7,115 from the firm at 6201 E. Randolph St., 90040.

Certified Tape Cassettes Have No 'Flutters,' 'Wows'

JERICHO, N.Y. – Tape cassettes from Certified Cassette Corp. are said to be specially designed to eliminate "chatter" that can cause "wow" and "flutter" in conventional cassettes.

The units have extra large, stainless steel pins, the firm said. They also contain a separate pressure pad and beryllium copper spring assembly which controls tape tracking and ensures proper tape path azimuth, fully coated graphitized Mylar antifriction pads to minimize static buildup and prevent jamming and heavy-duty tops and bottoms, the firm said.

The cassettes cost about $5 each from the firm at 333 Jericho Tnpk., 11753.

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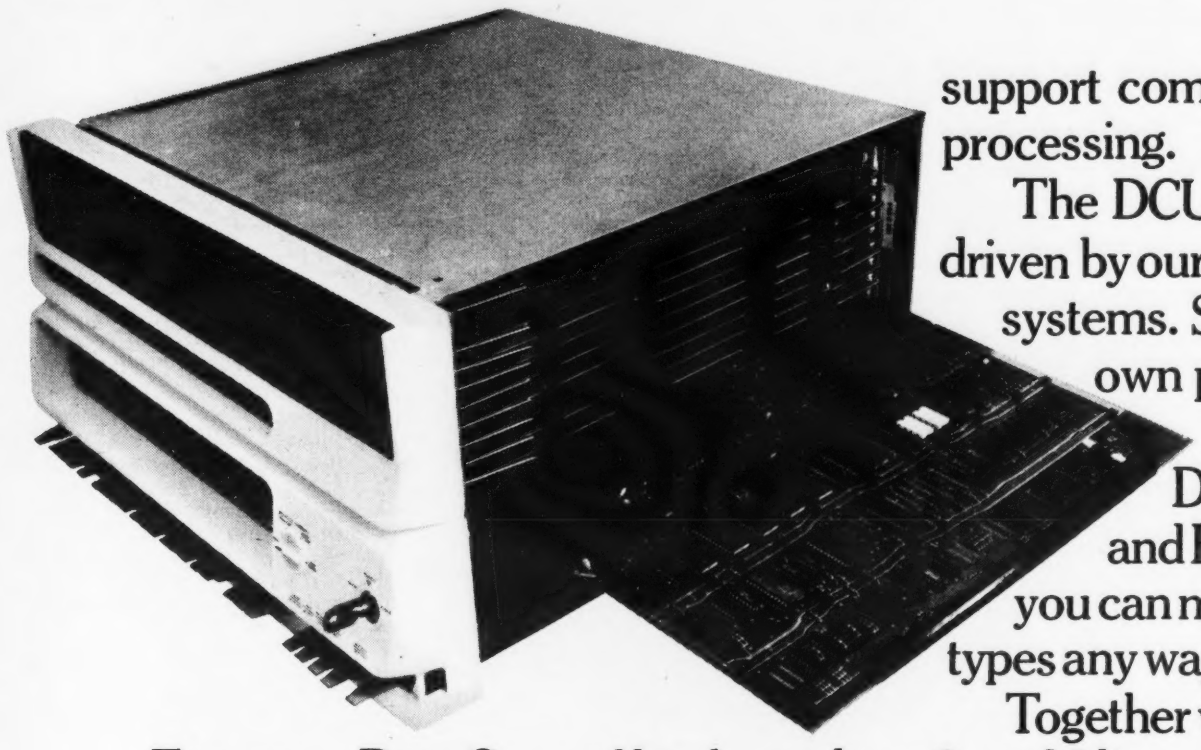


For years, Data General has been the company people have come to for basic communications networks. Because we've always made our computers, peripherals and software completely compatible with each other.

Now you can come to Data General if you want to build big, complex networks.

Because now we have the communications controller board you see here. The DCU/50 (Data Control Unit).

The DCU is designed to work in terminal, switcher, concentrator and front end systems. It takes care of line control and all the character processing. Which leaves the computer free to support communications message processing.

The DCU is programmable and driven by our real-time operating systems. So you can define your own protocols.

Or you can use our Data General teletypewriter and BISYNC protocols. And you can mix your protocols and line types any way you want.

Together with our high density 16, 8, and 2 line synchronous and asynchronous multiplexers, the DCU gives you direct memory access for extremely high throughput, with minimal systems overhead.

And when you need more speed and more lines, you won't have to throw out anything. You can add on to what you already have.

For example, you can start off interfacing our multiplexers directly to the computer. And later on, plug in the DCU.

Which means no matter how big or small you want your network to end up, you can start off communicating with Data General.

DataGeneral

Data General, Route 9, Southboro, Mass. 01772 (617) 485-9100. Data General (Canada) Ltd., Ontario,
Data General Europe, 15 Rue Le Sueur, Paris 75116, France. Data General Australia, Melbourne (03) 82-1361/Sydney (02) 908-1366.

Stimulates Inner Ear

PDP-8 Helps Totally Deaf 'Hear'

WASHINGTON, D.C. – Miniaturized computers may play a key role in the future development of "artificial hearing" for deaf persons who cannot be helped by conventional hearing aids.

Researchers here representing the University of Utah in Salt Lake City and the Ear Research Institute in Los Angeles recently described experimental work employing minicomputers to stimulate the inner ear. They reported that a subject, deaf from infancy, was able to sense "sounds" from the computer and differentiate them from vibrations.

Their latest experiments involved implanting a series of pinhead-sized platinum electrodes within the tiny, snail-shell-like cochlea (or inner ear), connected to an array of photo-isolated stimulus drivers designed by the Utah group. These drivers are controlled by a Digital Equipment Corp. PDP-8 minicomputer with 8K core and ASR-33 Teletype.

The drivers are interfaced to the electrodes through a special connector fastened to the skull and protruding through the skin behind the ear.

Deaf patients recognize different tones depending upon which electrode is stimulated, and further changes in sound can be achieved by changing the stimulus frequency. More complex sounds can be created by stimulating different electrodes at different frequencies under computer control; such experiments are now in progress.

A system incorporating a PDP-8/F permits this patient, deaf since birth, to report "sounds" when he presses a keyboard.

Once their experiments have been completed, the scientists plan to build portable devices containing appropriate microprocessors. They estimate such devices might be available in about three years.

However, the team stressed that the ear research is highly experimental. Depending on the extent of injury or disease, it may never be possible to restore completely normal hearing and "Walter Cronkite might sound like Donald Duck."

It also cautioned that the approach applies only to patients with a damaged cochlea. People in whom the hearing nerve has been destroyed would require more complex stimulation devices which might take decades to develop.

In its simplest form, the DEC system constitutes a keyboard-controlled pulse generator. However, a dual Dectape drive permits loading preplanned experimental protocols from one tape and automatic documentation of the patients' responses on the other tape.

The system is usually programmed in Fortran II, PAL-8 Assembly Language or both under DEC's OS/8 operating system. However, special compiler/assemblers, run on a time-shared Decsystem-10 elsewhere on campus, are often used. Such programs are employed particularly when the PDP-8 is connected – through a university-designed, full-parallel interface – to a PDP-11/05-based GT-40 graphics system.

The GT-40 graphics system and its associated 1.2M-word disk are used in continuing efforts to develop an analogous artificial vision for the blind.

Mini 'Rats' on Animal Behavior

LONDON – The Behavior Research Laboratory at University College here is making use of a mini in its research into conditioning and learning. The mini is used to report and analyze the learning tasks carried out by pigeons and rats.

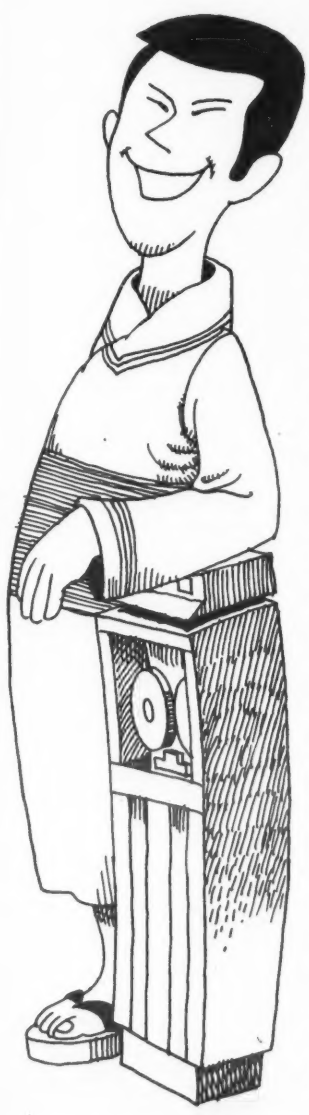
Use of the mini, which is connected on-line to the experimental chambers, allows easier and more flexible planning of learning tasks and greatly facilitates analysis of the results, compared with the hard-wired equipment previously used in this type of experiment.

Pigeons may, for example, be trained to peck at a series of illuminated disks, as a reward for which they obtain brief access to food. Once the basic behavior pattern has been instilled, the computer program can be altered to increase the complexity of the task, by altering the number of pecks required at each disk and the order in which the disks must be attacked to obtain the pellet.

The research is, of course, concerned with human as well as animal behavior. In one experiment, a rat, taught that it can obtain a food pellet by pressing a lever, is subsequently given a mild electric shock as well as the food each time the lever is pressed. Another rat in an adjoining compartment receives the same food and shock at the same time, but without a lever to control the situation. Analysis and comparison of the animals' behavior can provide information which is relevant to the behavior of humans in conditions of stress.

The equipment in use at the laboratory includes a Data General Nova 2/10 with 16K memory, a Texas Instruments Silent 733 ASR terminal and Silent 731 receive-only terminal, a random number generator and a special interface by Campden Instruments of London.

This interface is designed for use with the Automatic Contingency Translator (ACT), a purpose-built programming language for psychologists in behavioral research who have no previous knowledge of computers. ACT was developed to run on Nova computers by Dr. J.R. Millenson, now at McGill University.



Shukan

opens the door to the ever-expanding Japanese market.

The burgeoning Japanese computer market is the place to be, and Shukan Computer is the advertising vehicle to get you there. Japan is the second largest EDP market in the world, and the fastest growing. And according to the U.S. Department of Commerce, Japanese imports of EDP equipment will grow at a rate of 30% annually through 1977, when total imports will exceed $1 billion per year. The U.S. share of this market should remain constant at 55%, although in previous years the U.S. share has reached as high as 70%. The minicomputer market is expected to chart a phenomenal 60% annual growth rate through 1977, while independent peripheral equipment sales will rise at a 44% rate. And the market potential for U.S.-manufactured communications terminals is great, according to the U.S. Department of Commerce, because the U.S. equipment is technologically superior to that being manufactured in Japan.

Shukan Computer, Computerworld's sister publication in Japan, is a joint venture of Computerworld and the leading electronics publisher in Japan, Dempa Publications. Shukan is the only newsweekly for the computer community in Japan and with the combined resources of the two companies, it has the largest news gathering organization of its kind in the world.

Japanese businessmen read more than their American counterparts, and they place a greater value on the advertising they read. Buying decisions in Japan – unlike the common American system of one-man, "EDP Manager" control – are reached through development of consensus between several levels of operating management, including programmer and analyst levels. And Shukan goes to all these important buying influences. 23.5% of total circulation goes to Data Processing Management, 12.5% to Corporate Executives, and 27.9% goes to Professional Staff in the computer industry.

It's easy to advertise in Shukan. For a small surcharge, Shukan will translate your ad from English, set type, prepare a new mechanical and make a plate (rotary letterpress production). And with Computerworld representatives across the U.S. to assist you, you needn't go further than contact your area Computerworld salesman to place space in Shukan.

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If you'd like to know more about the Japanese market, we'll be glad to send you a free copy of our report "EDP Marketing in Japan". Just send in the coupon below – or contact your **Computerworld** representative.

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COMPUTERWORLD

Miniworld At Large

DP-Based Ticket Agency Sells To Clients in Stores

CUPERTINO, Calif. – A computer-based ticket agency centered in the San Francisco Bay area is revolutionizing the entertainment ticket sales industry by saving the customer's time and ending the embarrassing mix-ups that have plagued some non-data-based companies in the field.

What makes the Bay Area Seating Service (Bass) unusual is an ingenious use of CRT terminals and a heavy dependence upon the speed and accuracy unique to DP, according to Peter Schneidermeier, operations manager.

"Each of our employees must have a special background – a balance between a knowledge of computers and experience in the business of ticket selling," he said.

A total of 35 terminals, paired with specially designed, compatible ticket printers, are located at designated counters in stereo, record and department stores throughout the bay area. At these stations, potential ticket buyers, on request, may see up-to-the-minute seating information on the performance they plan to attend.

This information includes a reproduction on a TV-like screen of any section or row in the theater, hall or stadium showing available unsold seats. The purchaser may then choose the particular location desired and know exactly where it is long before the performance.

"Upon request, at any time of the day, we can tell exactly how many tickets have been sold, at what rate and, by measuring any changes in sales after the appearance of an advertisement, how effective the ad was."

Teletix System

Bass has also initiated the first phone-like ticket sales system, Schneidermeier said. This system, called Teletix, allows the ticket buyer to learn CRT-displayed information and purchase tickets without having to leave his own home. Based at the main Oakland office, Teletix operates 14 hours a day, seven days a week and allows buyers to use their credit cards over the phone.

At the heart of the system are two Hewlett-Packard (HP) 2000F minicomputers. System programming for Bass was done by a team of programmers headed by Dr. Bruce Baumgart of Stanford University's Artificial Intelligence Lab.

"Not only does Bass sell tickets, "said Schneidermeier, "but we give our clients a complete package. Not just ticket sales, but advertising and news releases.

Varian Gear Sails to Study Atmosphere

CHARLOTTESVILLE, Va. – Minicomputing equipment played a vital role in a recent major study of energy movements in the atmosphere. The four-month investigation, called Gate, was conducted in the tropical Atlantic.

The information it produced will help scientists test geophysical and meteorological theories and extend the range of weather prediction in space and time.

Gate cost about $50 million and entailed observations from aircraft, ships and satellites.

Dr. Michael Garstang – a professor in the Environmental Sciences Department at the University of Virginia – is one of the American scientists who participated in Gate.

Working aboard a U.S. Coast Guard cutter, Garstang and his colleagues used a Varian Series 620 computer and a Varian Statos 31 electrostatic printer/plotter as a real-time control system.

The system helped them deploy balloon-borne sensors that measured such variables as temperature, humidity and wind velocity.

In a typical experiment, Garstang and his colleagues dispatched a balloon to an altitude of several thousand feet. The balloon was tethered to the ship by an instrumentation cable that carried groups of sensors at five different altitudes. From each package of sensors, 16 data channels carried weather information to the shipboard computer system, where it was recorded on magnetic tape and charted by the printer/plotter.

AUSTRALIA

Authentic information is freely available **WITHOUT CHARGE** from the Australian Embassy in Washington, D.C. (202) 797-3000, and the Australian Consulate General in New York (212) 245-4000, San Francisco (415) 362-6160, Los Angeles (213) 380-4610 and Chicago (312) 329-1740.

Silent 700 ASR Data Terminals eliminate paper tape problems

with magnetic tape convenience and real cost-saving features...at an *affordable* $2750

Reduce operating cost

*Silent 700** ASR Electronic Data Terminals are designed to reduce operating costs. Compared to paper tape, the magnetic tape cassettes used in *Silent 700* ASR data terminals are faster, easier to handle, easier to edit, and easier to file.

They enable you to reduce training time and streamline operating procedures with complete off-line block and character data editing.

In cost-sensitive timesharing applications, *Silent 700* ASR terminals cut computer connect time with simultaneous on-line data transmission and off-line data preparation. And, they reduce line charges with transmission speeds of 10, 15, 30, and optionally 120 characters per second.

Reduce expansion cost

Additionally, *Silent 700* ASR terminals can reduce your system expansion costs. Their modular design allows you to enhance terminal performance as system requirements grow.

Many options are available for this purpose . . . such as built-in acoustic couplers and modems, 1200 Baud transmission, automatic answer and answer-back memory and automatic search of cassette control functions.

Reduce downtime

Silent 700 ASR data terminals are so reliable that you can virtually eliminate over-time work requirements caused by terminal downtime. How? The key factors are solid-state reliability backed by electronic integrated circuits, quiet electronic printhead, and accurate digital grade magnetic tape cassettes.

So, if you're concerned with improving the data handling operations of your firm . . . regardless of whether they involve point-to-point communications networks, data entry, or timesharing . . . TI can offer an *affordable* answer.

For more information on how the *Silent 700* ASR terminals can reduce your operating costs, call the nearest sales office listed below. Or, write Texas Instruments Incorporated, P.O. Box 1444, M/S 784, Houston, Texas 77001. Or, call Terminal Marketing at (713) 494-5115, Ext. 2126.

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Data Communications

Course #1010–

Practical Data Communications Systems and Concepts

This course will give you the information you need to master the newest developments in Data Communications. Led by the nationally recognized teleprocessing consultant, Dr. Dixon Doll, the course covers recent changes in areas like SDLC. HiD-LoD, DDS, newly approved major revisions to WATS, and the impact of satellite carriers. This seminar runs two days, and total cost, including workbook, reference materials, luncheons and continental breakfasts is $350. Additional registrants from the same company qualify for a reduced rate of $300. Current schedule is as follows:

Chicago – Jun. 2-3
Orlando – Jul. 2-3 **Washington, D. C.** – Jun. 9-10

Course #1020–

Advanced Teleprocessing Systems Analysis and Design

This course is a follow-up to Course #1010, with special emphasis on problem solving techniques for minimizing operating costs in commercial data communications networks. Also led by Dr. Dixon Doll, the course covers procedures, approaches and algorithms for evaluating and cost-optimizing network organizations.

This seminar runs three days, and total cost, including an extensive set of customized course materials, luncheons and continental breakfasts is $450. Additional registrants from the same company qualify for a reduced rate of $400. Current schedule is as follows:

Los Angeles – Jun. 16-18

Data Base Design

A practical approach to the design, implementation, and maintenance of data base systems.

Effective data base system design requires both a complete knowledge of the facilities provided by a data base package, and a basic understanding of the mechanisms which can be employed to construct data base systems. In fact, the former is of questionable value without the latter.

This course is a package independent examination of the techinques required for the design of effective data base systems. The topics covered include:

- *Effective Record Design*
- *Physical Storage Techniques*
- *Optimum File Organization and Indexing Techniques*
- *File Integration*
- *and much more*

Given in association with Leo J. Cohen and Performance Development Corporation, this course reinforces the lecture material with workshops, in which attendees apply the techniques, just learned, to practical problems.

You should attend this seminar if you are (or will be) involved in the design and/or implementation of a data base system and whether as a Data Base Designer, Planner or Analyst.

This course runs for 3 days and costs $350., including course materials, continental breakfasts and luncheons. Additional registrants from the same company qualify for a reduced rate of $300. Current schedule:

New York The Plaza June 2-4

Legal Tools for Computer Contracting & Protection

A seminar that gives you the legal tools you need for effective negotiations, agreement drafting, warranties, security, tax planning and software protection.

The impact of the law is felt in virtually every aspect of the computer industry, and you need to know how to apply the legal rules in a positive way to increase you advantage in dealing with vendors that supply your installation. This course teaches you how to avoid the legal pitfalls that can be costly and embarrassing to you.

Under the personal instruction of Roy N. Freed, a nationally known lawyer, author, educator and expert in the field of Computer Law, you'll learn how to protect your interests in subject areas like these: Negotiations, Contracts, Warranties, Avoidance and resolution of disputes, Security, Fraud, Taxation, as well as Techniques in handling any transaction. And practical discussion and review of your own contracts is an added feature of this seminar.

You should attend this seminar if you are involved in contracting for the use of computers or computer services–whether as a Corporate Executive, DP Manager, Contract Administrator, Consultant, Inside Counsel, or as a Private Practitioner involved with clients who use computers. Cost for the entire 2½ day seminar, including continental breakfasts, luncheons, and complete resource materials is $325. Additional registrants from the same company are charged only $275. Current Schedule:

New York St. Moritz June 4-6

Key-to-Storage Systems

How to evaluate and optimize the various successors to keypunch equipment.

Data entry is a big problem – and a big headache – as every computer user knows. It is therefore a prime target for cost savings. This course is designed to help you in the practical aspects of selecting, installing, and making the best use of keyboard-to-storage systems. It is an expansion and an update of our successful key-disk seminar. Under discussion (including some user case studies) will be:

- Introduction to data entry concepts (keypunch, buffered keypunch, keypunch, key-disk and beyond . . .)
- Key-disk hardware and software
- Evaluating . . . and starting . . . key-disk systems
- Selecting and operating intelligent terminals, both key-to-cassette and key-to-floppy disk
- Key-disk as a remote batch terminal
- Supervisor functions; motivation
- Mixed Media systems
- Trends in Computer Data Entry

This seminar is lead by Lawrence Feidelman, President of Management Information Corporation, and one of America's leading experts on data entry. All participants will receive a copy of "Data Entry Today", Management Information Corporation's authoritative publication on every aspect of data entry, including a six-month update of this continuing reference service.

You should attend this seminar if you are concerned with optimization of your data entry shop, and especially if you are considering or currently using key-to-storage systems more advanced than basic keypunch. Cost for the 3-day seminar is $350, including continental breakfasts, luncheons, and all course materials. Additional registrants from the same company are charged only $300.

Chicago Hyatt Regency O'Hare June 9-11

To: Ed Bride, Vice President, Editorial Services, Computerworld
797 Washington Street, Newton, Mass. 02160

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CW Photos by V. Farmer

Memorex emphasizes media support.

Mini Makers at NCC Say 'We're Going to Get Bigger'

By Toni Wiseman
Of the CW Staff

ANAHEIM, Calif. – Minicomputer makers are generally of one mind in projecting growth for the coming year – this year has been slow, but next year will show a sharp increase in sales and profit.

The overall feeling among mini makers represented at the 1975 National Computer Conference last week was best summarized by the statement, "We're still here, we're strong and we're going to get bigger."

"Business is beginning to pick up," said Paul Eisner, manager of sales promotion for General Automation, Inc. (GA), "and our long-term business is ideal."

The company has several contracts stretching out over the next five years, particularly in the banking and industrial process control areas, he added.

"GA's short-term business prospects were hurt by the LSI business last year," he said, "but we've written off $2 million, the situation has bottomed out and we're working on other products to combat its effects."

There has been a reorganization within GA in the last six months, with the vice-president of marketing now heading up the sales task force for the data management area. "The executives are now going out and making contacts and selling and this has had some tremendous results," Eisner noted.

In future months, GA will be broadening its business in each product area, with alternate methods of distribution. The DM 100 and DM 200 models, for example, will be handled by the GA sales force, while the DM 130/2 office system will be sold strictly on an OEM basis to companies such as QED and Neoterics on a distributor basis.

"The net effect is that the best people will be selling to each market, with distributors, who have more time, selling to first-time users who need handholding," he said. "We just can't compete with the IBM System/32 sales force."

Eisner predicted a trend toward data management, an area in which GA has been active since the introduction of its DM series last October.

GA has also recently bought Computek and has added its Series 200 programmable terminals to the GA product line, Eisner said.

Trend Toward 'Supermini'

At Hewlett-Packard, sales were up 50% from last year in terms of bookings at the end of the first half of May, according to Ed McCracken, marketing manager for the Data Systems Division.

"The last few months were especially good," McCracken said, "and we're looking forward to an even better second half."

CW Photo by N. French

Ed McCracken

This year's growth rate of 26% to 30% was down from the 52% achieved last year, he noted, but added "1976 looks like 1974 which, with its better than 50% growth rate is about as much as any company can handle."

The biggest trend is now toward the "supermini," machines like the HP 3000 or the Digital Equipment Corp. PDP-11/70, he said. "These minis have the power which used to be associated with larger mainframes, both computing power and memory size.

"The superminis have the capability of addressing more than 32K, and, with solid state, the price of these memories has been brought way down.

"This has been a very aggressive year for minicomputer companies," and, while some of the smaller companies have almost dropped out, those which remain will be concentrating heavily in the areas

(Continued on Page 41)

CW Photos by N. French

Brent Barkely

Joe Scorpa

Paul Lavoie

Intelligent Terminal Makers Seen Expanding Product Lines

By Nancy French
Of the CW Staff

ANAHEIM, Calif. – Even though not a single terminal manufacturer would admit to price cutting – and some actually said they had "increased their prices due to labor and materials costs" – almost every terminal exhibitor was either showing or talking about a new, lower cost model at the National Computer Conference here last week.

Defining intelligent terminals as those with capabilities that range from "doing some editing in local mode, such as the Beehive Super B, all the way up to a complete stand-alone computer such as the Datapoint 5500," almost all terminal manufacturers said they were expanding their product lines both ways.

Users are eager to buy terminals that give them "fewer errors, reduced turnaround time on order entry and local control of data distributed via networks," the vendors said.

Estimating that some $40 billion worth of intelligent terminals would be sold by 1980, Brent Barkely, marketing manager of terminal products for International Communications Corp. (ICC) Milgo, said his company would like to get "about $100 million worth of that business."

Lower cost terminals introduced recently include the General Electric Terminet 30, Datapoint 1100 diskette system, the Lear Siegler ADM-3, Sycor's IBM 3270 plug-compatible model and the Xerox IDS 10 and 20 and 3010 printer models.

Hardware Advantage

Ed McCracken, marketing manager of Hewlett-Packard's Data Systems Division, said an advantage of intelligent terminals is that hardware costs will decrease faster than the telephone company's communications charges.

"The price for a specific capability will drop 10% to 30% per year for the next few years and, at the same time, people will be buying more intelligence for the same dollar," he said.

McCracken also predicted intelligent terminals powered by microprocessors will soon eat into the low end of the minicomputer market. Minicomputer manu-

(Continued on Page 40)

Mini Peripherals Vendors Cite 'Positive Future' in Industry

By Toni Wiseman
Of the CW Staff

ANAHEIM, Calif. – Following the upward trend of the minicomputer industry, manufacturers of minicomputer peripherals at NCC last week foretold a positive future for their industry.

"Sales are up 20% over last year, despite embargoes, depressions and shortages, and next year looks like a year of additional growth," said Ralph Gabai, marketing vice-president for Pertec Corp.'s Peripheral Equipment Division.

Pertec as a whole realized $33 million in revenues last year, he said, and expects that figure to be around $45 million for this year.

Disk sales are growing at twice the rate of tape, but tape sales remain strong, Gabai said.

In the near future, Pertec will be concentrating its efforts on marketing the D1000 family of fixed-disk drives, including the 6M-byte D1400 and 12M-byte D1600. The T9000 vacuum column tape transport will also be promoted, he added.

Wangco Expects Growth

Short-term business is picking up rapidly, George Toor, vice-president of marketing for Wangco, Inc., said. The company also expects to see substantial long-term growth with its move into the tape and disk controller business for Novas.

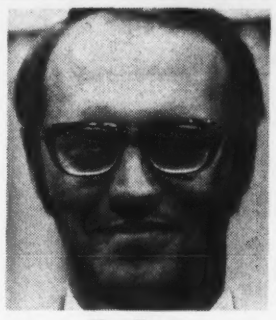
Toor predicted a 30% to 40% growth during the new fiscal year, with this year's business up only a little over last year.

"Wangco is gravitating to more comprehensive peripheral subsystems," he said. "We're getting closer to a computer than ever before with what we're building today."

Peripherals will be expanding with greater variety, higher density and greater speed, he predicted.

(Continued on Page 41)

'Dumb' Terminals Still Comprise Viable Market, Vendors Assert


Hamilton

Cagen

Willey

By Nancy French
Of the CW Staff

ANAHEIM, Calif. – Although the marketplace is moving increasingly toward intelligence in terminals, with many so-called "dumb" terminal makers adding an intelligent model or two to their lines, the dumb terminal in itself is still a very viable market, according to vendors interviewed on the floor of the National Computer Conference here last week.

Not everybody needs a $3,500 intelligent terminal, Bruce Hamilton, executive vice-president of TEC, Inc., remarked.

"In fact, the world is filled with people who are looking for a cheaper way to do a job, and if there's a way they'll find it," he said.

For users who are simply looking for interactive capability, the dumb terminal is still a viable product.

This is particularly true when one considers the growing use of front-end processors, according to Richard Willey, vice-president of sales at Computer Communications, Inc.

These systems place less emphasis on the terminal, he explained.

Most Growth

Dennis Cagan, western regional manager of Lear Siegler, predicted the largest growth in the terminal market in the next five years will be in the low-end glass teletypewriter type of terminal for replacing the Teletype Model 33.

Estimating that about 500,000 CRTs have been installed to date, Cagan predicted in five to 10 years the number of installed CRT units will increase to 20 million to 50 million units.

Despite increasing pressure from competitive models of dumb and intelligent terminals, not one vendor said his price had been reduced in the past year.

"The introduction of the MOS chip and microprocessors have halved the price of terminals compared with earlier models," Willey said.

Other vendors, however, said the rising cost of labor and materials has made further price reductions impossible.

Rather than changing prices on existing models, several firms said they have introduced new models with more features at the low end of their product lines.

Among the new models at lower and lower prices are the Lear Siegler Model ADM-3, which sells for $995, and TEC's Model 1440 Tele-Tec, for $1,195.

No one would comment on any shakeout, but Hamilton admitted "a few dumb terminal manufacturers are in big trouble."

Frank Richins, national sales manager for Beehive Terminals, said that although demand for dumb terminals will level off eventually and the prices will decrease, prices currently are holding stable.

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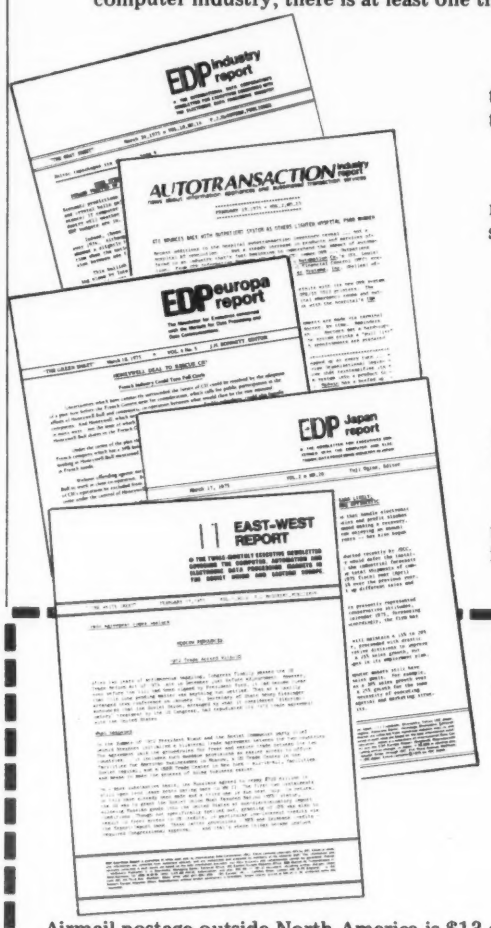

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Terminal Exhibits Focus on Intelligence

(Continued from Page 39)

facturers, on the other hand, are beginning to build "super" minis, he said.

"Terminals – the man/machine interface – is the fastest growing segment of the computer marketplace," said Tom Livoti, product manager for Xerox Data System's new IDS 10 and 20 product line.

Range of Terminals

The growth of terminals has progressed from the CRT that looked like a teletypewriter to one with a multidrop and data set share capability to the reprogrammable intelligent systems, Livoti said.

Joe Scorpa, manager of the systems sales program for ICC/Milgo, said the greatest market lies in distributed processing – getting computer power down to the user level, giving that user some local data base capability.

But research reports have said users will progress to intelligent terminals in steps.

Gradual Progression

Rich Baldwin, district manager for Datapoint Corp., echoed the gradual progression theory, especially with new users.

"We start with a small, first-time data processing user and sell it a small diskette-equipped 1100 model to do payroll and accounts receivable. For general ledger, the customer builds its own tapes and takes the data to a service bureau for processing.

"Then we grow 'em to the 2200, and then into the Model 5500," he explained.

Intelligent terminals also can reduce the load on a mainframe in a teleprocessing network, explained Paul Lavoie, vice-president of marketing at Sycor, Inc.

"If a computer is servicing a large number of unintelligent terminals, the computer will need to do more work," he pointed out.

Use of intelligent terminals is growing in state and local government, Lavoie said.

"These systems started out being inquiry-response systems for Welfare and Medicare records. Now they're being used for data entry," he said.

Business has not changed much from last year, Lavoie said. "We've had a good first quarter, with $11 million in sales.

"Our shipping rates and backlog have held firm, and we expect business to stay about the same," he said.

Mini Makers at NCC Projecting Increased Growth for Next Year

(Continued from Page 39)

of telecommunication and autotransaction, he predicted, areas where minis are taking the load off the larger systems.

Modcomp Optimistic

Optimism was also dominant at the Modular Computer Systems (Modcomp) booth, where Ed Marinaro, head of marketing, noted it "looks like some sectors which had been soft are coming back, government business is coming back and power utilities and petrochemicals are also getting stronger."

"If we stay flat with current shipments, we'll see a 40% growth over last year," Marinaro said, "and we should see a better than average industry growth over last year, too."

For this year, Modcomp will be concentrating on improving its share of the markets it is currently in, Marinaro said.

But, he predicted, over the next several years the industry will be seeing more large system concepts brought down to small systems and networks, an area in which Modcomp has a "good technical advantage, a capability we intend to exploit and be aggressive in."

Modcomp has already been quietly in the networking area for some 18 months with 15 to 20 installations so far, he noted, adding the company will soon begin tailoring networks for specific applications.

Laszlo Keresztury, president of Keronix, Inc., sees business a little lower than the first half of last year and about the same as the second half, but he, too, is looking forward to good long-term prospects in terms of general business.

"The trend now is toward industrial process control and service automation and administration in fields such as law and medicine," he said.

Prime Computer, Inc. is projecting $12 million in sales for 1975, a little less than double the 1974 figure of $7 million, according to Bruce Chrane, director of national sales.

CW Photo by V. Farmer

Laszlo Keresztury

CW Photo by N. French

Ed Marinaro

"The trend is now toward interactive terminal use, in-house time-sharing and communications," Chrane said, noting Prime will be adding some extensions to its hardware family, thereby expanding its number of users significantly.

The upgrades will include two new processors with virtual storage, stressing systems integration capability.

Prime will also be looking at data base management, Chrane stated, as well as transaction processing with its First System which has been test-marketed in Great Britain.

Ronald Meyer, vice-president of marketing for Harris, foresees a rapid growth rate for the minicomputer industry and a proliferation of applications.

"The classical mini (DEC PDP-8 or PDP-11/05) is being impacted by the microcomputer," he said. "Micros are and will continue to move into that market segment."

The total mini market is growing because it is becoming software-enriched, he said, citing the advent of a Cobol compiler for a minicomputer.

Harris systems, he said, are capable of doing remote job entry, remote batch, real-time, and background batch all concurrently, a capability usually associated with systems of the Control Data Corp. CDC 6600 variety.

"This doesn't mean that minis are as powerful as a 6600," he cautioned, "but they are moving in the direction of offloading the CPU and putting the task closer to the user."

Business Picking Up for Mini Peripherals

(Continued from Page 39)

"The end-user market has a bad image because of the image of some of the more prominent companies in that area. I feel there are opportunities for us in markets closer to the end user, but I don't anticipate getting into the IBM plug-compatible business," he said.

Both the tape and disk markets are tremendously competitive, Toor said, noting the industry is seeing a higher rate of attrition in the disk market.

Although Applied Data Communications (ADC) is "just starting out," business is looking good and the company is "highly competitive economically."

Commenting on business for the next three to six months, Roger Saville, marketing manager for ADC, saw a "fairly nominal slope in the right direction.

"As of September, however, there will be a fast growth on the order of three to one over what the company has done before," Saville said.

The dollar volume is in the OEM business, Saville noted, but the number of customers is few. ADC will, therefore, be orienting toward the end users for more customers, while continuing to woo OEMers.

Developmental emphasis in the coming year, he said, will be directed to data entry and word processing systems, where its product fits the market best.

Sykes Sees 10% Sales Increase

"Business for the next three months looks much stronger than it did over the last 12 months," Rod Belden, president of Sykes Datatronics, Inc. said. "Over the next 12 months, I expect to see a 10% increase in sales and also better profitability."

Sykes' focus will be heavily on floppy systems, he said, noting the floppy market is still young enough that no one has won the race.

Sykes, he said, will be using its floppy as the basis for application products, building systems designed for data communications, data collection and small business DP.

"Business in the next few months will largely be increasing in the end-user market," Belden said. This does not mean the company is retrenching its OEM business. "We expect to grow in both areas, simply more on the end-user side."

Tony Coppola, director of sales operations for the Computer Products Division of Electronic Memories & Magnetics Corp. (EMM) said, "I think users are beginning to evaluate their inventory and their needs, and, therefore, we are experiencing the beginning of a business upturn based on inventory adjustments."

In the near future, EMM will be making a major investment in the manufacture and marketing of 30M- and 50M-byte data modules.

The recently introduced Caelus product will be on the order of the Century Data Trident disk drives, with first deliveries this year, he said.

The company will also be evaluating fixed disks with capabilities in the range of 12M bytes and 24M bytes, Coppola said, an upgrade from the present Caelus 103 fixed-disk product.

"Caelus currently has end-user capability for IBM products, and we will in the future evalute end-user applications of our current product line," he said, "but we will continue pursuing the OEM market and the sophisticated end users with technical expertise.

George D. Roessler, vice-president of marketing for Diva, Inc., anticipates a 30% growth in sales this year because of a slow start caused by the general economy. This compares with 100% increase in sales in 1974, he said.

At the present level of sophistication of the minicomputer, he said putting a minicomputer system together no longer requires heavy electronics engineering ability; the applications analyst is most important.

The analyst only needs a working knowledge of how the system works and rarely does he need to have the ability of designing the system himself, he said.

From a position of being 100% OEM-oriented in 1969, Diva's sales are now 60% to sophisticated end users and 40% to OEMers, according to Roessler.

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With Rugged '74 Behind Them

Vendors See Rosy '75, Say '76 Will Be Even Better

By Toni Wiseman
Of the CW Staff

ANAHEIM, Calif. – Fiscal year 1974 was a little rugged for most companies in the computer industry but, to a man, the industry is looking forward to a rosier fiscal 1975 and many firms are predicting even greater things for 1976.

"Last year was a record for us," said Roy Wigginton, marketing vice-president for Storage Technology Corp. (STC).

"This year has started out a little slower, due to the price increase which became effective the first of the year, but we expected that."

STC will be promoting its 8000 disk series this year, he said, particularly the Super Disk 8800 and 8400 modules.

The product line, ranging from the single-spindle 8100 module to the 8800 (800M-byte) Super Disk, offers flexibility in designing configurations for any size installation, according to the company.

The Super Disk has already been shipped to two locations and shipments of the 8100, a competitor of the IBM 3330, will begin this month.

"The entire product line is in the process of moving along with great impetus," Wigginton said, "and, once we have a few installations to use for reference, the line will add a lot to our overall business."

Another product earmarked to help STC's overall sales position is the combination of the 6,250 bit/in. tape drive and the Super Disk, which will compete with IBM's 3850 mass storage system.

The disk market is more competitive than tape, he said, and STC feels the only real competition in the tape area currently is IBM.

"At first, we were facing a slew of companies such as Ampex, Telex, Potter, etc., but for a long time now, we've only been up against IBM," Wigginton said.

"In the disk market, however, we have to recognize there are other vendors out there. Some people thought we were crazy to get into a market where there is so much competition, but we feel we can hold our own with our disk subsystems," he said.

At Decision Data, Richard Schwab, executive director of marketing, sees business improving in both the short and long term, with the marketplace evolving and different opportunities appearing for each.

"Looking backward, customers are coming out from behind their grey economic clouds, when they were touching and smelling but not buying," he said.

People in the end-user environment are now looking to the future, but are still very cost-conscious.

"They're not yet making long-term – three- to five-year – commitments, but they are finally willing to make decisions to do something," he stated.

Decision Data has a tremendous foothold in the System/3 market, but that is not the only area of emphasis for the coming year, he said, admitting it will be taking advantage of its customer base in the System/3 area.

"The year 1975 is a year of new products for Decision Data, each aimed at building on the company's existing customer base," according to Frank McPherson, vice-president of marketing.

"Many of the new products slated during the year are aimed specifically at providing better system performance, at reduced cost for current customers, with the balance of the System/3 market representing a vast potential for these products."

Underlining this marketing plan, Decision Data introduced three products at the National Computer Conference, including a low-cost replacement printer for the System/3, an accounting feature for 96-column card data recorders and a 96- to 80-column card converter.

In July, the company will be introducing memory for the System/3, Schwab said.

Xerox is right on plan for the first quarter of the year, according to vice-president of marketing Bob Adams, and it expects to realize a 20% increase in revenues over last year.

Marketing emphasis this year will be on increasing the capability of host processors, including multiprocessing, and on the continuation of a line of products aimed at the network end of the computer market, including terminals, Adams stated. Xerox introduced one member of this family, the 3010 communications terminal, at the show here.

This emphasis, Adams noted, is in keeping with the user trend toward workstations: "The user wants a variety of input devices and he wants a choice of where he will do his processing – at his desk, at the CPU or wherever."

"Control Data Corp., which had sales of $1.1 billion last year, is already ahead of this year's increased quota, having realized an 18% growth over last year so far," stated marketing representative H.J. Belles.

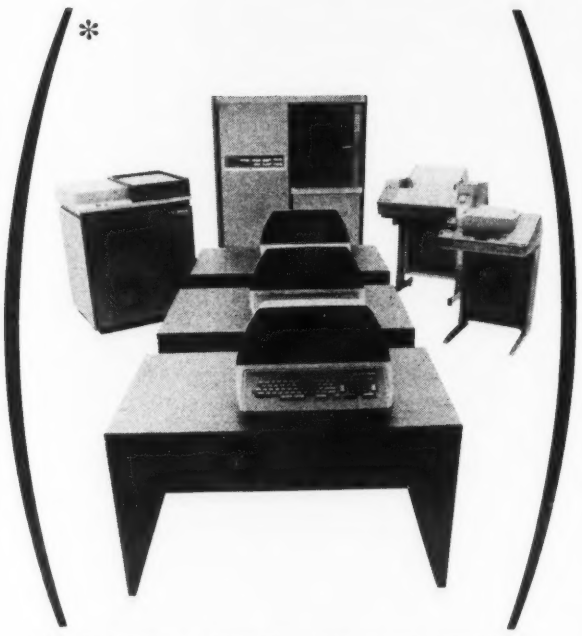
CDC is looking forward to a continued good year, which will be boosted by the introduction of the CDC 38500 mass storage system, capable of storing up to 8M characters in a cartridge.

CDC will also be looking toward greater productivity and profitability, he said, "and not just taking orders for orders' sake."

Correction

Univac Germany has sold 100 of its 90/30 systems over the past 10 months [CW, May 7].

GREAT COMPUTER SECRETS*



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Iomec Half the Way to Becoming Major Mini Peripherals Maker

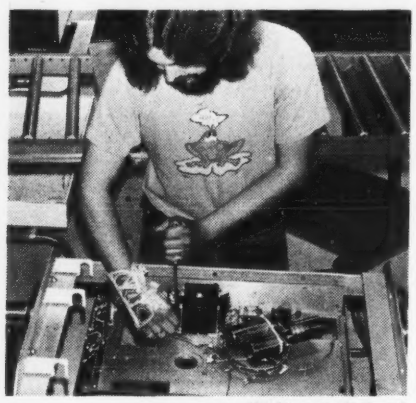
By Nancy French
Of the CW Staff

SANTA CLARA, Calif. – In three years, Iomec, Inc. could "become a major supplier of minicomputer peripherals in the $50 million to $70 million class, and we're halfway there this year," Steve Clark, Iomec vice-president, said in a recent interview here.

While Wangco and Pertec may dominate the minicomputer tape drive market, Diablo the disk drive market and Data Products the high-speed printer market, Iomec alone offers OEM customers a complete line of minicomputer peripheral products, he said.

In addition to the company's line of minicomputer peripherals, Clark is enthusiastic about a portable numeric "poor man's point-of-sale terminal" known as Portaverter.

Clark, who joined Iomec in December, is determined to concentrate on maximizing the potential of the existing product line, especially the Portaverter which he said "could produce more business by the end of 1976 than all the OEM peripherals put together."



CW Photos by N. French

Disk Drive Being Made

Clark realizes that, to continue growing, the company has to sell the products it has developed. "Too many people in the computer industry pursue technology for the sake of technology and forget to be profitable," he said.

"They never ask themselves who is going to use this stuff," he said. "Pure technology for its own sake died in 1970."

To bring marketing under control, Clark has divided the sales organization into three district units – one to handle the Portaverter and any new members of that family of equipment, another to handle paper tape products, magnetic tape and card readers and a third to sell the rest of the peripherals line.

The disk drives are tied with the Portaverter as Iomec's strongest product, he said.

Commenting on the rest of the product line, Clark said "there's a $2 billion data entry market out there and I'd be happy to get a couple of percent."

Clark said he sees little competition in the line printer market.

The paper tape market, while a mature marketplace with relatively flat technology, "is a nice profit generator.

"We're number 2 in paper tape in the U.S. today, and I'd like to solidify that position, make inroads against Remex," he said.

Iomec installed between 4,000 and 5,000 Portaverter terminals in 1974. Clark said he would "like to increase that installed base by 50% this year and double that in 1976."

Equipped with batteries for portable data entry, the machine produces a hard copy for error control as well as recording data on a tape cartridge for transmission by phone to a central computer site.

Assembly of Head for Series 3000 Drive

Steve Clark

The Portaverter could be greatly improved by adding a bar code reader "and we're working with a major manufacturer on that right now," he admitted.

The market is still inventory control for supermarkets, shoe store chains and a new really big market – record stores, he said.

Credit unions use the Portaverter to transmit weekly financial transactions. "We already have 2,000 Portaverters in credit unions, and now Electronic Data Systems is selling the Portaverter as part of its credit union facilities management package," Clark said.

Sider Program Offers 'Money Back' Clause

ENCINO, Calif. – A program maintenance tool is being offered to individual programmers with a guarantee that twice the amount of the first month's rent will be paid to unsatisfied customers.

The Text Maintenance System (TXTM) from Joseph Sider and Associates, Inc., which aids programmers in creating and modifying IBM 360 and 370 programs, has been completely checked out and no significant change has been necessary.

TXTM rents for $150/year per programmer; the first month cost is $25.

If, after meeting certain criteria, the user rejects TXTM, he will receive $50 from Sider and Associates at 15713 Vardon St., 91316 when the program is returned.

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Another reason is Pansophic's attention to users after the sale. This past year saw Customer Support staff double in size. The enhancement people in R&D have expanded significantly. And our computerized customer data base allows us to respond to user needs instantly.

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NCC Provides a Treat for Mini, Small System Users

(Continued from Page 10)

runs all DEC diagnostics without patching, the firm said.

It has a 900 nsec cycle time and 350 nsec access time.

A one-year warranty is offered.

Cipher is at 7510 Clairemont Mesa Blvd., San Diego, Calif. 92111.

Sykes Software Drivers

Software drivers for use with Sykes floppy disk on 10 minicomputer operating systems were released by Sykes Datatronics, Inc.

The software drivers permit a Sykes floppy disk to be used as the system device or as an auxiliary device, depending on configuration. All Sykes floppy disk systems with the software drivers read and write data in an IBM-compatible format.

Operating systems now running on the Sykes floppy disk include: DEC OS/8, RT-11, 4K Disk Monitor; Data General Corp. Nova Sykes Disk Operating System (SDOS); Varian Data Machines MOS, E-Basic; Hewlett-Packard (HP) DOS III, DOS-M, MTS; and Interdata Corp. DOS.

Users do no programming to run these operating systems on Sykes floppy disk systems. Prices range from $250 to $400.

Sykes also introduced a controller, six computer interfaces and six software drivers for use with the Diablo Series 10 flexible disk drive. The controller, computer interfaces and software drivers may be purchased separately or packaged as a table-top or rack-mount system with drives.

Sykes controller Series 7000D connects directly to Diablo Series 10 disk drives and reads/writes data in IBM format. Controller hardware is said to perform all searching, data blocking, address verification and head unloading. Hardware interfaces and software drivers are available with Sykes 7000D for PDP-8, PDP-11, Nova, HP-2100, Interdata and Varian computers. A single controller is priced at $699.

In addition, Sykes has a package and a lower price for its Sykesdisk 7000 family of floppy disk systems. The table-top or rack-mount package is 9.7 in. high and houses up to two disk drives, controller, power supply and computer interface.

List prices for the Sykesdisk floppy system are $2,490 single drive and $3,390 dual drive. Typical computer interfaces cost $300. Sykes is at 375 Orchard St., Rochester, N.Y. 14606.

Kybe Digital Cassette

Kybe Corp. introduced its CT-103 digital cassette.

The CT-103 can serve as a read/write or read-only memory, a bit/sec rate multiplier of up to 1,200 bit/sec or a terminal text/data buffer.

The CT-103 is offered ready to use and includes an automatic bidirectional file search capability, unattended operations capability, a simultaneous RS-232C/20MA loop interface, Ansi/Ecma-compatible transport mechanism, motion control electronics and power supply.

The design is said to reduce wear and provide for positive registration of the head with the tape's data track. A single capstan controls forward motion past the head.

Kybe is at 132 Calvary St., Waltham, Mass. 02154.

Talos Alpha/Tablet

Talos Systems, Inc. introduced the Alpha/Tablet system for inputting hand-printed alpha/numeric data into a system.

Utilizing a ball-point pen, the operator writes the message on a piece of paper, and it is instantly translated into standard Ascii characters, the firm said.

The system is based upon two proprietary items, the Talos data tablet and a hardware/software package capable of recognizing up to 56 characters.

Real-time feedback as to what has been inputted is available to the operator on a character-by-character display or a line or block output on a video terminals or teletypewriter.

Miniworld at NCC

In addition to the Talos data tablet and digitizer, Talos also manufactures and markets Telenote voice graphic systems that instantly reproduce handwriting and sketches over standard telephone lines.

Talos is at 7311 East Evans Road, Scottsdale, Ariz. 85260.

Interface Mechanisms Printer

A serial impact bar code for random input short runs of black and white bar-coded labels is available from Interface Mechanisms, Inc.

The printer, Model 8124, is said to be able to produce any common bar code format for applications ranging from supermarket point of sale (POS) to industrial material handling. The unit features an integral Prom microprocessor to allow program flexibility.

The Model 8124 prints on paper labels or perforated tags in continuous roll form using a dry carbon ribbon to produce bar codes with high optical contrast and sharply defined edges. The printer can be equipped with a 31-character set basic keyboard, and a full alphanumeric keyboard can be added for extended character sets.

Single unit price for a serial interface configuration is $5,820.

Interface Mechanisms is at 5503 232nd St. S.W., Mountlake Terrace, Wash. 98043.

Rela Designs, Inc. offered for Data General minis three interfaces to: line printers, character printers and an RS-232 line interface.

While the firm designed its line printer interface specifically for Okidata Corp., Facit-Addo, Inc., Centronics and Potter printers, Rela said the unit, priced at $600, appears to be applicable to most printers on the market.

The character-printer interface works with Diablo and Qume printers and is said to allow full use of the plotting capability of the printers. It also is priced at $600.

The RS-232 interface is said to provide control over 24 input and 24 output lines. It may be used for modem control or, with appropriate programming, it may be used to handle serial communications at up to 300 bit/sec. It is priced at $500.

Rela is at 1322 Arapahoe, Boulder, Colo. 80302.

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With Introduction of 3300

Inforex Key-to-Disk Focus on High End

BURLINGTON, Mass. – The market for high-capability key-to-disk systems is growing as users become more sophisticated in their desires and capabilities in this area, according to Jay Hill, director of marketing support for Inforex, Inc.

To follow this trend, Inforex is announcing the 3300, with more extensive editing capabilities than the 1300 series, he said.

The high end of the key-to-disk market was traditionally smaller than the low end, the keypunch replacement units. However, the scene is changing, he said.

The original Inforex 1301 key-to-disk system was relatively simple, as Inforex felt users would be hesitant about installing sophisticated systems, John O'Keefe, manager of product support for the 3300, said.

Computer Machinery Corp. (CMC) and Inforex between them captured about 60% of the key-to-disk market with their keypunch replacement systems, and now other firms are offering lower level systems.

Conversely, Inforex 3300 expands its market by aiming at the higher end.

Inforex Survey

A survey conducted by Inforex of its installed base as well as users of other systems revealed high-end systems in many cases were not being used for much more than keypunch replacement because of the users' inability to implement routines.

Users generally cited the complex programming languages and the need to get programmers to help write applications.

To counter this, the Inforex 3300 offers a "parametric programming language" which uses a tutorial or prompting approach to help users write programs, said O'Keefe.

O'Keefe said he envisions users eventually putting some applications on the 3300 they cannot put on the mainframe because programmers had not gotten around to writing a small application.

Inforex expects the 3300 to impact its existing base. "We see a reasonably high displacement," said Hill.

Reception of the product has been good by both current users and prospects who do not have key-to-disk systems installed.

Inforex will also place some marketing emphasis on installations with competitors' equipment, said Hill, although that is usually a "slow sell."

Product Life Expectancy

The product life of key-to-disk will exceed expectations, said Hill. Although research reports predicted the key-to-disk market would peak at the end of 1974-1975, the timetable keeps stretching out, he said.

He doesn't see any direct replacement for key-to-disk, in the same manner key-to-disk replaced the keypunch.

There is a definite migration to data entry at the source, but he noted the firm's 5000 file management system and the 3300 are designed to go with that migration.

He admitted Inforex is somewhat concerned about the concept of putting terminals everywhere. The industry is being pushed to provide more intelligence at the source, but there is a question of the capability of stand-alone systems vs. those with a shared processor, Hill added.

CW Photos by M. Upton

John O'Keefe

"There will be a market for shared-processor systems if they stay up with technology and take advantage of sharing cost of logic and data storage," added O'Keefe.

On-Line Systems No Cure-All

A poll taken a year and a half ago showed users were shying away from on-line systems as a cure-all, said O'Keefe, citing high transmission cost, excessive implementation time, the need to expand the CPU and a decrease in keystroke productivity.

These factors help to make key-to-disk all the more viable as a concept, they said.

Jay Hill

Inforex's classical competitor is CMC, but tomorrow it could well be Univac, Hill said. Inforex has felt minor impact from Univac so far, he said, noting Univac really hasn't put too much selling muscle behind the product and has had some shakedown problems that appear to have been solved.

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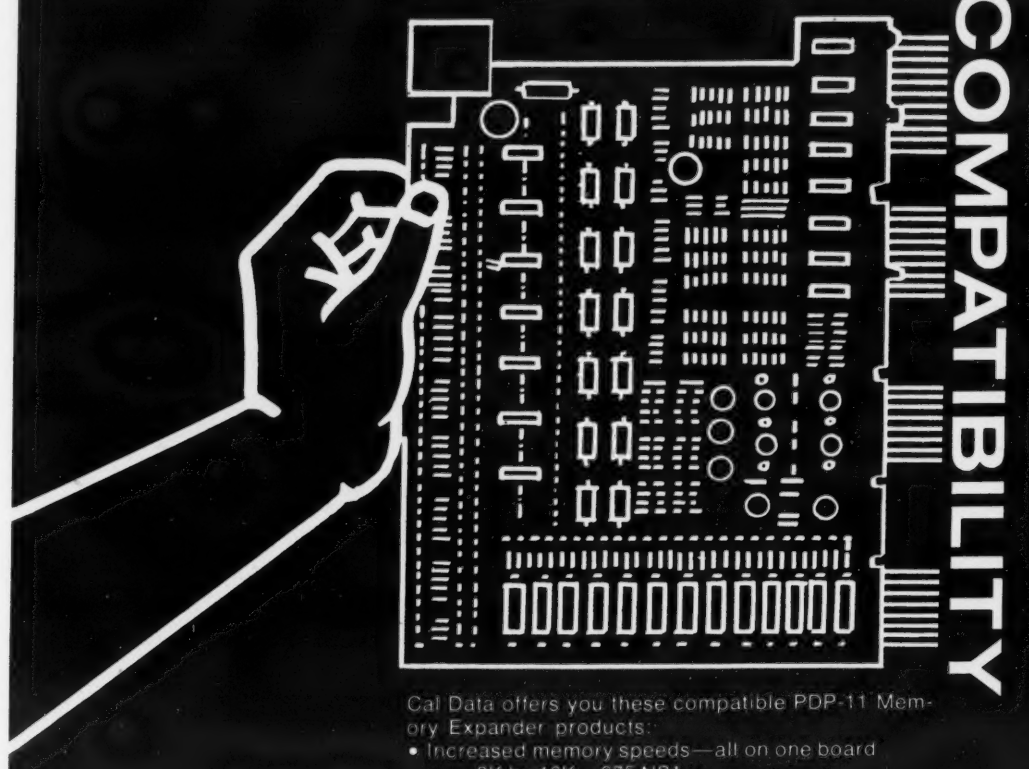

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Tri-Data Diversifies Line, Sees '76 as Best Ever

By Nancy French
Of the CW Staff

MOUNTAIN VIEW, Calif. – Tri-Data Corp. has reacted to a business slowdown imposed by lagging sales to the semiconductor industry of its automated test equipment by diversifying its product line.

"We think we've reacted quickly enough," Allen Sanders, marketing manager, said.

"We've been doing our homework – diversifying our products and broadening our market and sales opportunities so we will be prepared for an economic upturn.

"At least we're not sitting here wringing our hands," he said.

"I don't want to be in the position of saying the economy is going to improve in the third quarter, but, judging from the increase in orders we've had, we think our business will begin to recover about the third quarter and business in 1976 should exceed all previous years," he said.

Allen Sanders

If orders keep improving at the rate they are at the moment, Sanders said manufacturing will be back on a full five-day work week in one or two months.

Among Tri-Data's new products is the Flexifile 10, a $1,600 paper tape emulator designed to do the job of the paper tape reader/punch faster and without modification to the user's existing paper tape software.

"We acquired Data Recognition Corp. of Palo Alto and finished development of its optical character reader system for banking credit card companies and utilities applications. Our first Ades-1 has been sold and installed at New York's Chase Manhattan Bank," he said.

Tri-Data is also "taking existing equipment and designing new interfaces so it may be used in data communications, numeric control and the phototypesetting businesses – areas we have never addressed before," Sanders explained.

The company hopes to manufacture and sell the Flexifile 10 in large volume. "In the phototypesetting business alone, there are half a million reader punches in use. This product can save phototypesetters thousands of hours," he said.

"In calendar year 1975, after startup, we hope to ship 200 to 300 units," he explained, "any many, many more in 1976."

Tri-Data hopes to ship five additional Ades-1s during 1975, he said.

The Ades-1 is a minicomputer-controlled device that automates the volume processing of documents and remittances.

Acquisition of Data Recognition brought in a second marketing department, which Tri-Data management decided to keep as a separate entity.

The marketing force for the OEM product line is managed separately from those handling the Ades or end-user product line.

All support services, however, have been combined, including contract administration, advertising and promotion and service departments.

Service department personnel have been cross-trained and Tri-Data now has service personnel in seven U.S. cities, he said.

Established in 1968 on the premise that the industry needed a reliable tape cartridge, Tri-Data now produces a family of Cartrifile magnetic tape systems including read/write electronics, tape unit controller and power supply that has proved especially effective under adverse conditions, according to Sanders.

Two-Track Format

The 1/4-in. by 1-1/2-mil endless loop tape cartridge, available in a variety of lengths, has a special two-track format to eliminate problems caused by skew, edge wear and jitters.

"A typical application is a program used in blood analyzer equipment. The blood analyzers are shipped at -200°F," Sanders explained.

"The tapes containing the programs go right along with it, and after they're allowed to warm up for 24 hours, they work without a flaw," he explained.

The cartridges and the cartridge systems are also used in process control applications.

The Flexible 52, a dual-drive flexible disk system built in a cartridge, was designed to serve as a program loading device, but many users are so satisfied with it they want to use it as a systems device, Sanders said.

Wabash flexible disks buy'em by the box or buy the file.

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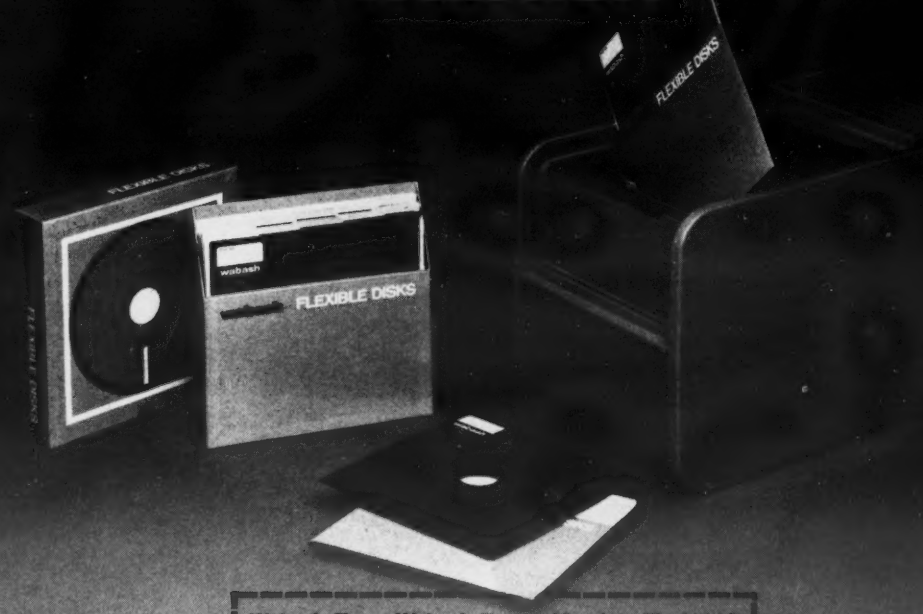

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IBM Recycling Unit Saves Former Sewage

SAN JOSE, Calif. – A recycling unit installed at the IBM plant site here is expected to save more than five million gallons of water per year – the average amount used by 22 homes, according to the company.

Applying a technique used in the metal industry for collecting chrome residues, approximately 60% of the demineralized water used in disk storage production for spraying and rinsing processes is being recycled by a system composed of a control unit, anion exchanger and carbon filter. This water was previously discharged as sewage.

The anion exchanger removes chromates and flourides while the carbon filter collects organics such as detergents so the demineralized water can be used again in the multiple disk cleaning processes.

The ion-exchange resins are regenerated monthly by injection of sodium hydroxide, and accumulated minerals and organics are disposed of as waste.

Cbema Organizes Unit To Provide NRMA Aid

WASHINGTON, D.C. – The Computer and Business Equipment Manufacturers Association (Cbema) has formed a Manufacturers Technical Advisory Committee to provide technical assistance to the National Retail Merchants Association (NRMA).

The committee assumes all functions of the previous Manufacturers Liaison Committee and will advise the NRMA on technological information relating to voluntary standards for merchandise identification, customer identification, source marking and other specifications NRMA may request.

Starting With Superconductivity

Advances Cited in Hardware Technology

Technological advances in memories and computers are in the news again, varying from a patent issued for a cross-tie memory system to an Electron Beam Accessed Memory undergoing evaluation by Control Data Corp.

While of less immediate application, IBM researchers have found that superconductivity, the complete absence of electrical resistance, can exist in a polymeric material. This discovery has implications in a broad range of areas, including both CPUs and memories.

The U.S. Patent Office has granted patents on cross-tie memory techniques to Leonard J. Schwee, a research physicist at the Naval Surface Weapons Center at Silver Spring, Md.

The memory can be fabricated on a silicon wafer and features high speed and density and low cost and power consumption, Schwee said.

By improving the magnetic properties of the cross-tie film, he believes storage can be increased to 70M bit/sq-in.

Control Data Corp. is conducting evaluation tests of a prototype of an Electron Beam Accessed Memory (Ebam) from Micro-Bit Corp. of Lexington, Mass.

The unit, being tested on a Star 1B computer as a fast paging device, has a capacity of 1.2M bits distributed in nine parallel channels with 128K bits each and has an access time of 16 μsec to any page, Micro-Bit said.

The memory combines MOS technology with electron-beam access.

The first Ebam product is scheduled to be introduced in mid-'76 and will have 18 parallel channels, each with a capacity of 4.2M bits for a total system capacity of 75M bits, the firm said.

At IBM, Richard L. Green and G. Bryan Street of the San Jose Research Laboratory and Laurance J. Suter of Stanford University have observed that polysulfur nitride crystals switched to the superconducting state when the temperature was .25 degrees above absolute zero.

The discovery indicates superconductivity is more widespread than presently believed, since the polymer consists of elements of sulfur and nitrogen – elements from a region of the periodic table which previously had shown no superconductivity at atmospheric pressure.

'Adam' Uses English, Not Software

By Catherine Arnst
Of the CW Staff

BURLINGAME, Calif. – An Englishman has created what he called "a new beginning in the computer world" – Adam, billed as the world's first computer that needs neither programmers nor software.

John Peers wanted to develop a computer that would remove the mystique of the machine for the average user.

He reasoned that, just as many people who drive cars don't want to know how the engine works, so many business people don't want to understand how computers work.

Adam requires no software and uses English as its language and, Peers claimed, anyone can be trained to operate it in two days.

Designed for small businesses, it doesn't use codes, punched cards, tapes, assemblies or added attachments. It needs no special humidity rooms or power facilities, he said.

'Taught Via Keyboard'

Adam "learns" the meaning of new words in terms of previously learned words and is "taught" the difference between verbs, nouns and structures via a keyboard.

It contains about 50 words to begin with, such as "multiply, file, if, difference, total," etc.

Every word used that Adam doesn't have in memory must be taught it by the user. "Teaching Adam is like teaching a selective dictionary to someone who already understands English," Peers said.

Peers first got the idea for a simplified computer as a programmer in England. He came to California to take advantage of the microcircuit industry here and because of the more cohesive market in this country for Adam due to what he felt were more open-minded attitudes and receptiveness to new concepts.

In October 1974 he formed John Peers and Co., Inc. with 12 employees to market Adam. Two systems were installed free in January for five weeks, and Peers said both were bought by their users.

So far there have been two reactions to his system, he said. "Computer experts think it's a con, and businessmen say it's what they've been waiting for."

Believes Adam Revolutionary

Peers believes Adam will revolutionize the industry because it is built to serve the user rather than the programmer. "I am very thrilled about our product, but am even more thrilled about the concept."

Adam will leave the programmer and systems analyst a troubled man, Peers said, because it will increase the use of computers, but at the same time decrease the need for people trained only to work with computers.

He likened what Adam could do for the computer industry to what happened to transportation when the country switched from trains to the motorcar. The train was so expensive it had to be run for a large number of people, but the motorcar allowed a consumer to have his own mode of transportation.

There is no logical limit to what Adam can do, Peers said. Currently, it can only do one job at a time and be used by only one person at a time. However, Peers is now developing a multi-Adam to be announced in the fall, which will allow several people to have access to the computer.

Adam is priced at $39,995; Peers claimed the user will save twice the cost over seven years. He expects his business to increase 5,000% in the next 14 to 15 months.

Peers has offered to teach Adam to solve a potential customer's problem in just a single morning or afternoon. "We believe in simply exposing our merchandise to the danger of being evaluated. We think it will stand up well," Peers concluded.

Executive Corner

■ Daniel L. Ritchie, Joseph Barlock and Joseph Mikita have resigned as directors of the board of directors of Computer Investors Group, Inc., leaving the board at seven members. The men represent Longines-Wittnauer, Inc., a subsidiary of Westinghouse Electric Corp., which owns about 34% of CIG stock.

■ Larry E. Reeder has been elected vice-president of operations staff at Keydata Corp.

■ Thomas Murphy and Robert Bishop have been named vice-presidents of Itel Corp.'s Lease Marketing Division of the Data Products Group.

■ C. Keith Law has been elected vice-president of customer service of Incoterm Corp.

■ Frederick J. Kemper has been appointed corporate vice-president of Brandon Applied Systems' third Systems Development Division.

Position Announcements

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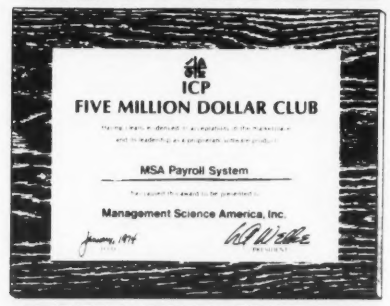

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Lessors Report Depressed Quarters

Three leasing companies showed diminished quarterly results, generally reflecting the erosion in IBM 360 results.

Computer Investors Group, Inc. and Bresnahan Computer Corp. reported depressed results for the nine months and first quarter, respectively.

DPF, Inc. showed a loss for the third quarter but nine-month results were improved over those of a year ago.

A fourth firm, Boothe Computer Corp., continued the trend set earlier in the year of reducing its year-ago loss.

For the year ended Dec. 31, the firm lost $3.6 million or $1.59 a share compared with $21.2 million or $9.95 a share last year.

Revenues fell to $42.9 million compared with $46.3 million in 1973.

During the fourth quarter, the loss shrank to $592,000 or 26 cents a share compared with nearly $10 million or $4.69 a share.

The 1974 losses included additional depreciation charges of $14.5 million, of which $9.5 million was taken in the fourth quarter, and nonrecurring charges of $2.5 million by manufacturing subsidiaries.

Courier Terminal Systems, Inc. and Boothe Airside Systems, Inc. were primarily responsible for operating losses, the firm said.

Results for computer leasing activities were about as forecast.

At DPF, Inc., operating income prior to extraordinary charges rose during the nine months to $122,000 compared with the break-even level experienced in the year-ago period.

However, during the third quarter, operating income showed a loss of $14,000 compared with break-even.

Revenues for the nine months dropped to $20 million compared with $23 million during the year-ago period.

Earnings totaled $4.3 million or $1.02 a share compared with $1.1 million or 26 cents a share in the same 1974 period.

The 1975 earnings resulted from a $2.2 million gain on repurchase of debentures and a nearly $2 million tax credit.

During the three months, revenues also declined, to $6 million compared with $7.5 million last year.

DPF lost $14,000 compared with earnings of $566,000 during the third quarter.

DPF has prepaid in full its IBM indebtedness, the firm said.

Computer Investors Group, Inc. (CIG) showed a loss of $912,966 or 42 cents a share for the nine months ended Dec. 31.

This compares with earnings of $384,696 or 18 cents a share in the year-ago period.

A spokesman cited high interest costs and the continuing erosion of 360 and older equipment on lease.

Revenues for the year rose to $22.2 million compared with $15.8 million in the same period last year.

Bresnahan Computer Corp.'s drop in earnings for the first quarter ended Dec. 31 reflected an additional depreciation charge of $39,000.

Since the firm anticipates a further erosion of rental rates resulting in only a nominal cumulative profit over the remaining estimated life of its 360s, it has begun taking additional depreciation charges that should result in only nominal profits from computer leasing, a spokesman said.

During the quarter, Bresnahan earned $22,000 or 1 cent a share compared with $93,000 or 5 cents a share in the year-ago period.

Revenues dropped to $910,000 compared with $1.2 million in the same 1973 period.

The 1973 earnings figure, restated to reflect expensing as incurred in R&D costs, includes an additional $12,000.

Wang Labs Scores Nine-Month Drop

TEWKSBURY, Mass. – Late shipments because of programming delays caused Wang Laboratories, Inc.'s third-quarter and nine-month earnings to drop, although revenues increased.

In the third quarter, the firm earned $170,000 or 4 cents a share compared with $1.2 million or 29 cents a share in the year-ago period.

Revenues grew to $17.2 million in the quarter compared with $16 million in the year-ago period.

For the nine months, earnings dropped to $1.8 million or 44 cents a share compared with nearly $3 million or 74 cents a share in the same 1974 period.

Nine-month revenues reached $50.9 million compared with $43.9 million in the year-ago period.

Expenses continue high but in line with expanding new orders, the firm said. Backlog is building from newly announced products.

During the fourth quarter, deliveries are expected to be more in balance with orders, the firm said.

Decision Data Nets 201% Increase In First-Quarter Earnings Results

HORSHAM, Pa. – With help from a $162,000 tax credit, Decision Data Computer Corp.'s earnings for the first quarter rose 201% to $425,000 or 4 cents a share compared with $141,000 or 4 cents a share in the year-ago period, when there was a $66,000 tax credit.

Revenues grew to $11.7 million compared with $7.2 million in the same period last year.

Negotiating Financing

Decision, which makes 96-column card punch/interpreters as well as other card equipment, is negotiating a $30 million total long-term debt financing program, which it said will replace its present financing arrangements.

Two-thirds of the proceeds will be used to finance its lease base and the remainder for working capital and general corporate purposes, the company said.

The firm is cautious in its outlook for the next two quarters, since many OEMs continue to defer decisions. However, the long-term outlook of the company is very optimistic, noted Loren A. Schultz, president.

New Registrations

COMPU-SERV NETWORK, INC., 5000 Arlington Centre Blvd., Columbus, Ohio 43220, a programming and data processing service firm, filed to register 431,437 shares of common and to distribute them to the shareholders of Ilex Corp. at the rate of one-half of one Compu-Serv share for each Ilex common share. No underwriter is involved.

SYSTEM DEVELOPMENT CORP., 2500 Colorado Ave., Santa Monica, Calif. 90406, a computer-based systems firm, filed to register stock purchase warrants to purchase 54,054 shares of common and 50,000 common shares at $10 and $12 per share respectively: 104,054 shares of common issuable by the company upon the exercise of the stock purchase warrants and 50,000 shares of common of the company presently held by certain company stockholders. No underwriter is involved.

...Toward the Bottom Line

Itel shareholders have approved the repurchase of 1.6 million common shares in exchange for 160,000 shares of preferred stock. The move will reduce ownership of American Express from 27% to 8% of Itel's outstanding stock.

$ $ $

Current development and start-up costs of **Telenet Communications** contributed to the $274,900 loss posted by parent Bolt Beranek and Newman for the nine months compared with earnings of $15.7 million in the year-ago period.

$ $ $

Wavetek Data Communications had its best quarter in history in the period ended April 12 and yielded the largest profit of any Wavetek subsidiary. Corporate earnings declined to $145,700 compared with $92,000 in the year-ago period.

$ $ $

Tab Products is doubling its dividend by paying 5 cents a share on a quarterly rather than semiannual basis. The first quarterly dividend is payable June 16 to shareholders of record May 20.

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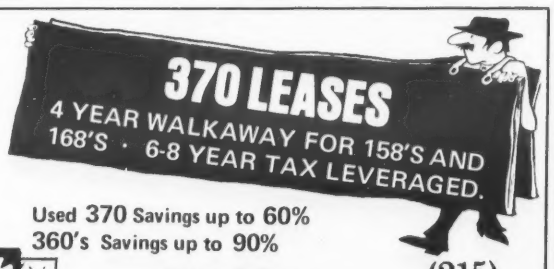

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Earnings Reports

GRAHAM MAGNETICS
Three Months Ended March 31

	1975	1974
Shr Ernd	$.18	$.34
Revenue	3,635,095	3,881,684
Earnings	167,811	317,786
9 Mo Shr	.88	.98
Revenue	11,883,388	11,178,749
Earnings	830,793	920,154

MACRODATA
Three Months Ended March 31

	1975	1974
Shr Ernd	$.17	$.22
Revenue	3,008,509	3,000,076
Earnings	174,724	178,389

DATA 100
Three Months Ended March 31

	1975	1974
Shr Ernd	$.40	$.29
Revenue	20,852,000	13,913,000
Tax Cred	580,000	360,000
Earnings	1,380,000	891,000

DECISION DATA COMPUTER
Three Months Ended March 31

	1975	1974
Shr Ernd	$.11	$.04
Revenue	11,690,000	7,234,000
Tax Cred	162,000	66,000
Earnings	425,000	141,000

CODEX
Three Months Ended March 31

	1975	1974
Shr Ernd	$.73	$.71
Revenue	6,237,000	3,929,000
Tax Cred	.....	496,000
Earnings	1,107,000	1,034,000
6 Mo Shr	1.45	1.27
Revenue	12,329,000	7,156,000
Tax Cred	.....	882,000
Earnings	2,183,000	1,852,000

COMPUTER AUTOMATION
Three Months Ended March 30

	1975	1974
Shr Ernd	$.17	$.32
Revenue	5,359,606	5,606,820
Earnings	277,042	540,258
9 Mo Shr	.48	.80
Revenue	15,616,790	13,760,252
Earnings	792,943	1,338,670

COMPUTER HORIZONS
Year Ended Feb. 28

	1975	a1974
Shr Ernd	$.10	$.27
Revenue	2,643,817	3,072,995
Disc Op	9,379	2,805
Spec Chg	.....	40,272
Earnings	58,431	164,750

a-Restated.

COMSHARE
Three Months Ended March 31

	1975	a1974
Shr Ernd	$.28	$.27
Revenue	3,127,711	2,533,500
Tax Cred	192,000	179,000
Earnings	376,028	358,829
9 Mo Shr	.86	.60
Revenue	8,767,780	7,012,799
Tax Cred	565,000	396,000
Earnings	1,164,039	792,735

a-Restated to reflect accounting change.

NUCLEAR DATA
Year Ended Feb. 28

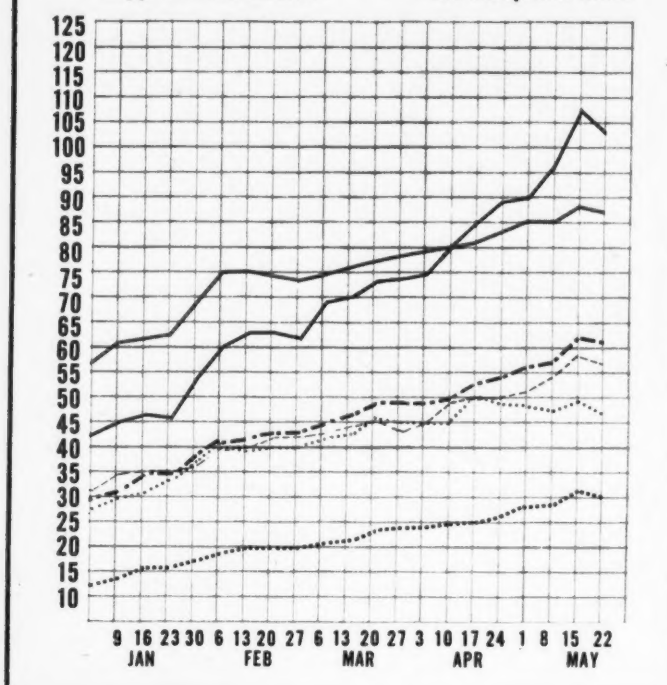
	1975	1974
Shr Ernd	$1.10	$1.05
Revenue	19,448,141	18,960,883
Tax Cred	290,000	326,000
Earnings	941,042	913,009

DOCUTEL
Three Months Ended March 31

	1975	a1974
Shr Ernd	$.02	.....
Revenue	5,812,000	$5,252,000
Tax Cred	29,000	.....
Earnings	63,000	(697,000)

a-Restated.

COMPUTERWORLD Computer Stocks Trading Indexes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TRADE*QUOTES

Computerworld Stock Trading Summary

CLOSING PRICES WEDNESDAY, MAY 21, 1975

All statistics compiled, computed and formatted by TRADE★QUOTES, INC. Cambridge, Mass. 02139

COMPUTER SYSTEMS

EXCH		1974 RANGE (1)	CLOSE MAY 21 1975	WEEK NET CHNGE	WEEK PCT CHNGE
N	BURROUGHS CORP	62-109	100 3/4	-6 5/8	-6.1
O	COMPUTER AUTOMATION	2- 14	6 5/8	-1 3/8	-17.1
N	CONTROL DATA CORP	10- 38	21 3/4	-1 1/4	-5.4
N	DATA GENERAL CORP	10- 38	28 1/2	-2 1/4	-7.3
O	DATAPOINT CORP	5- 20	19 1/4	+1	+5.4
O	DIGITAL COMP CONTROL	1- 5	3	0	0.0
N	DIGITAL EQUIPMENT	46-121	104	-6	-5.4
N	ELECTRONIC ASSOC.	1- 3	3 1/4	+ 1/2	+18.1
A	ELECTRONIC ENGINEER.	4- 11	9	- 1/8	-1.3
N	FOXBORO	19- 48	35	-1 7/8	-5.0
O	GENERAL AUTOMATION	6- 40	8 3/4	-1 3/8	-13.5
O	GRI COMPUTER CORP	1- 2	7/8	- 1/4	-22.2
N	HEWLETT-PACKARD CO	54-109	104 1/2	-2 1/8	-1.9
N	HONEYWELL INC	18- 86	33	- 5/8	-1.8
N	IBM	152-251	212 3/4	-10 3/4	-4.8
O	MEMOREX	2- 10	7	+ 1/4	+3.7
O	MICRODATA CORP	1- 5	3 7/8	- 1/8	-3.1
O	MODULAR COMPUTER SYS	5- 18	16 1/4	+ 3/4	+4.8
N	NCR	14- 40	36 1/8	- 5/8	-1.7
N	PERKIN-ELMER	15- 40	25 1/8	-1 7/8	-6.9
N	RAYTHEON CO	21- 46	44 3/8	-1 1/8	-2.4
N	SINGER COMPANY	10- 15	14 1/2	- 5/8	-4.1
N	SPERRY RAND	24- 47	45 1/4	-1 1/4	-2.6
A	SYSTEMS ENG. LABS	1- 4	3 1/4	0	0.0
O	ULTIMACC SYSTEMS INC	1- 4	5 5/8	- 1/8	-2.1
N	VARIAN ASSOCIATES	6- 13	11 1/2	+ 1/4	+2.2
N	WANG LABS.	7- 20	14	- 5/8	-4.2
N	XEROX CORP	50-127	75 3/4	-10 1/2	-12.1

LEASING COMPANIES

EXCH		1974 RANGE (1)	CLOSE MAY 21 1975	WEEK NET CHNGE	WEEK PCT CHNGE
O	COMDISCO INC	1- 7	4	- 1/2	-11.1
A	COMMERCE GROUP CORP	2- 6	2 7/8	- 1/8	-4.1
A	COMPUTER INVSTRS GRP	0- 4	7/8	-	-6.7
M	DATRONIC RENTAL	1- 1	1/2	- 1/8	-20.0
A	DCL INC	0- 1	3/8	+	+16.7
N	DPF INC	2- 5	4 3/4	- 1/8	-2.5
O	EDP RESOURCES	2- 3	2	0	0.0
A	GRANITE MGT	1- 5	3 7/8	- 3/8	-8.8
A	GREYHOUND COMPUTER	2- 6	3 1/8	+ 1/8	+4.1
A	ITEL	3- 7	6 1/2	+ 1/4	+4.0
N	LEASCO CORP	4- 12	9 1/2	- 1/8	-2.2
O	LEASPAC CORP	1- 2	1/4	0	0.0
O	LECTRO MGT INC	1- 1	1/8	0	0.0
O	NRG INC	1- 5	2	- 1/2	-20.0
A	PIONEER TEX CORP	2- 10	4	0	0.0
A	ROCKWOOD COMPUTER	1- 1	5/8	0	0.0
N	U.S. LEASING	5- 24	10 3/8	- 5/8	-5.6

SOFTWARE & EDP SERVICES

EXCH		1974 RANGE (1)	CLOSE MAY 21 1975	WEEK NET CHNGE	WEEK PCT CHNGE
O	ADVANCED COMP TECH	1- 2	1 1/8	0	0.0
A	APPLIED DATA RES.	1- 10	2 7/8	+ 1/2	+21.0
N	AUTOMATIC DATA PROC	21- 59	55 5/8	-3 3/8	-5.7
O	BRANDON APPLIED SYST	1- 1	1/8	0	0.0
O	CENTRAL DATA SYSTEMS	3- 6	3 1/4	0	0.0
O	COMPUTER DIMENSIONS	1- 5	5 1/4	+ 1/4	+5.0
O	COMP ELECTION SYSTMS	3- 5	5 1/4	+ 1/8	+2.4
O	COMPUTER HORIZONS	1- 5	1 1/8	0	0.0
O	COMPUTER NETWORK	1- 2	1 5/8	- 1/2	-23.5
N	COMPUTER SCIENCES	2- 5	4 3/4	+ 1/8	+2.7
O	COMPUTER TASK GROUP	1- 1	3/4	0	0.0
O	COMPUTER USAGE	2- 4	2 1/2	- 3/8	-13.0
O	CONSHARE	2- 4	3 7/8	0	0.0
O	DATATAB	1- 3	1 1/8	0	0.0
A	ELECT COMP PROG	1- 1	1/4	0	0.0
N	ELECTRONIC DATA SYS.	11- 28	24 1/2	-2 3/4	-10.0
O	INFONATIONAL INC	1- 2	1/8	0	0.0
O	IPS COMPUTER MARKET.	1- 1	3/4	0	0.0
O	KEANE ASSOCIATES	2- 4	3 1/4	0	0.0
O	KEYDATA CORP	1- 6	2 1/8	- 1/8	-5.5
O	LOGICON	2- 5	4 3/4	- 1/4	-5.0
A	MANAGEMENT DATA	1- 2	2 1/8	+ 3/8	+21.4
O	NATIONAL CSS INC	5- 37	11 1/2	-1 1/2	-11.5
O	NATIONAL COMPUTER CO	1- 1	1/8	- 1/8	-50.0
A	ON LINE SYSTEMS INC	9- 30	13 3/4	+3 1/8	+29.4
N	PLANNING RESEARCH	2- 5	3 3/4	- 1/2	-11.7
O	PROGRAMMING & SYS	1- 1	3/4	0	0.0
O	RAPIDATA INC	1- 5	4	- 1/4	-5.8
O	SCIENTIFIC COMPUTERS	1- 1	1	0	0.0
O	SIMPLICITY COMPUTER	1- 1	1/4	0	0.0
O	TYMSHARE INC	6- 19	18 3/4	+2 7/8	+18.1
A	URS SYSTEMS	2- 4	2 5/8	- 1/8	-4.5
N	WYLY CORP	1- 5	3	0	0.0

PERIPHERALS & SUBSYSTEMS

EXCH		1974 RANGE (1)	CLOSE MAY 21 1975	WEEK NET CHNGE	WEEK PCT CHNGE
N	ADDRESSOGRAPH-MULT	3- 11	8 7/8	+ 3/8	+4.4
O	ADVANCED MEMORY SYS	1- 7	4 1/8	+ 1/4	+6.4
N	AMPEX CORP	2- 6	5 7/8	+ 3/8	+6.8
O	ANDERSON JACOBSON	1- 4	2 7/8	+ 1/8	+4.5
O	BEEHIVE MEDICAL ELEC	1- 7	4 5/8	- 5/8	-11.9
A	BOLT,BERANEK & NEW	5- 9	7	+ 1/8	+1.8
N	BUNKER-RAMO	3- 8	6 3/8	0	0.0
A	CALCOMP	4- 11	5 5/8	- 1/8	-2.1
O	CAMBRIDGE MEMORIES	3- 16	5 1/8	- 1/8	-2.3
N	CENTRONICS DATA COMP	7- 23	19	+2 1/8	+12.5
O	CODEX CORP	8- 36	34 1/4	-1 1/4	-3.5
O	COGNITRONICS	1- 2	1 3/8	0	0.0
O	COMPUTER COMMUN.	1- 2	1/2	- 1/8	-20.0
O	COMPUTER CONSOLES	2- 7	6 1/4	+ 1/4	+4.1
A	COMPUTER EQUIPMENT	1- 2	1 5/8	+ 1/8	+8.3
O	COMPUTER MACHINERY	1- 5	1 1/4	- 1/8	-9.0
O	COMPUTER TRANSCEIVER	1- 2	1 3/8	0	0.0
O	COMTEN	1- 5	4 1/8	- 1/4	-5.7
N	CONRAC CORP	10- 22	17 3/8	-1 7/8	-9.7
O	DATA ACCESS SYSTEMS	2- 3	2 1/4	+ 1/4	+12.5
O	DATA 100	4- 16	13 3/4	-2	-12.6
A	DATA PRODUCTS CORP	2- 5	4 5/8	+ 1/8	+2.7
O	DATA TECHNOLOGY	1- 4	1 5/8	0	0.0
O	DATUM INC	1- 4	7/8	- 1/8	-12.5
O	DECISION DATA COMPUT	3- 13	5 1/8	- 5/8	-10.8
O	DELTA DATA SYSTEMS	1- 2	1/4	0	0.0
O	DIVAN CONTROLS	1- 2	1 3/8	+ 1/4	+22.2
N	ELECTRONIC M & M	1- 4	2	- 1/4	-11.1
O	FABRI-TEK	1- 3	1 1/8	- 1/8	-10.0
O	GENERAL COMPUTER SYS	1- 4	2	0	0.0
N	HAZELTINE CORP	2- 7	3 3/8	- 1/4	-6.8
N	HARRIS CORP	13- 34	20 5/8	+ 1/2	+2.4
A	INCOTERM CORP	1- 7	5 3/8	-1 1/8	-17.3
O	INFOREX INC	1- 5	3 1/4	- 7/8	-21.2
O	INFORMATION INTL INC	6- 14	10 1/8	- 1/8	-1.2
A	LUNDY ELECTRONICS	3- 3	2 7/8	0	0.0
O	MANAGEMENT ASSIST	1- 1	1/2	- 1/8	-20.0
A	MILGO ELECTRONICS	6- 19	18 5/8	+ 3/8	+2.0
N	MOHAWK DATA SCI	1- 5	3 1/8	+ 1/8	+4.1
O	OPTICAL SCANNING	2- 6	2 3/4	0	0.0
O	PERTEC CORP	1- 8	6 3/4	- 1/8	-1.8
A	POTTER INSTRUMENT	1- 5	1 3/4	0	0.0
O	PRECISION INST.	1- 3	3/8	0	0.0
O	QUANTOR CORP	2- 8	3 1/4	- 1/4	-7.1
O	RECOGNITION EQUIP	2- 5	4 3/4	+ 1/4	+5.5
N	SANDERS ASSOCIATES	2- 8	8	+1 3/8	+20.7
O	SCAN DATA	1- 3	2	- 1/2	-20.0
O	STORAGE TECHNOLOGY	6- 15	12 1/4	- 1/4	-2.0
O	SYCOR INC	4- 14	12	0	0.0
O	TALLY CORP.	1- 5	4 1/2	+1	+28.5
O	TEC INC	1- 7	2 1/4	0	0.0
N	TEKTRONIX INC	18- 48	35 1/2	- 5/8	-1.7
N	TELEX	1- 4	2 1/8	- 1/4	-10.5
O	WANGCO INC	3- 13	6 1/4	+ 1/8	+2.0
O	WILTEK INC	1- 8	3	0	0.0

SUPPLIES & ACCESSORIES

EXCH		1974 RANGE (1)	CLOSE MAY 21 1975	WEEK NET CHNGE	WEEK PCT CHNGE
O	BALTIMORE BUS FORMS	4- 6	5 1/4	0	0.0
A	BARRY WRIGHT	4- 7	5 3/4	+ 1/8	+2.2
O	CYBERNATICS INC	1- 2	3/4	0	0.0
A	DATA DOCUMENTS	23- 54	38 1/2	-1 1/8	-2.9
O	DUPLEX PRODUCTS INC	6- 25	20 7/8	-2 1/8	-9.2
N	ENNIS BUS. FORMS	4- 7	6	- 1/2	-7.6
O	GRAHAM MAGNETICS	5- 11	7 3/4	0	0.0
O	GRAPHIC CONTROLS	6- 19	16 1/2	+1 1/4	+8.1
N	3M COMPANY	43- 79	65	-1 1/4	-1.8
O	MOORE CORP LTD	33- 57	47 3/4	- 1/4	-0.5
N	NASHUA CORP	15- 45	20 1/2	- 5/8	-2.9
O	REYNOLDS & REYNOLD	6- 35	18	-5	-21.7
O	STANDARD REGISTER	10- 18	16 1/2	- 1/2	-2.9
O	TAB PRODUCTS CO	4- 11	6 3/4	+ 1/4	+3.8
N	UARCO	13- 24	22	- 5/8	-2.7
O	VANIER GRAPHICS CORP	3- 7	6 1/2	0	0.0
A	WABASH MAGNETICS	3- 7	4 3/8	+ 1/4	+6.0
N	WALLACE BUS FORMS	14- 25	22	+1	+4.7

EXCH: N=NEW YORK; A=AMERICAN; P=PHIL-BALT-WASH
L=NATIONAL; M=MIDWEST; O=OVER-THE-COUNTER
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